Automotive Service Digest

Our 49th year

March, 1961

Collision diagnosis and correction—See page 22.

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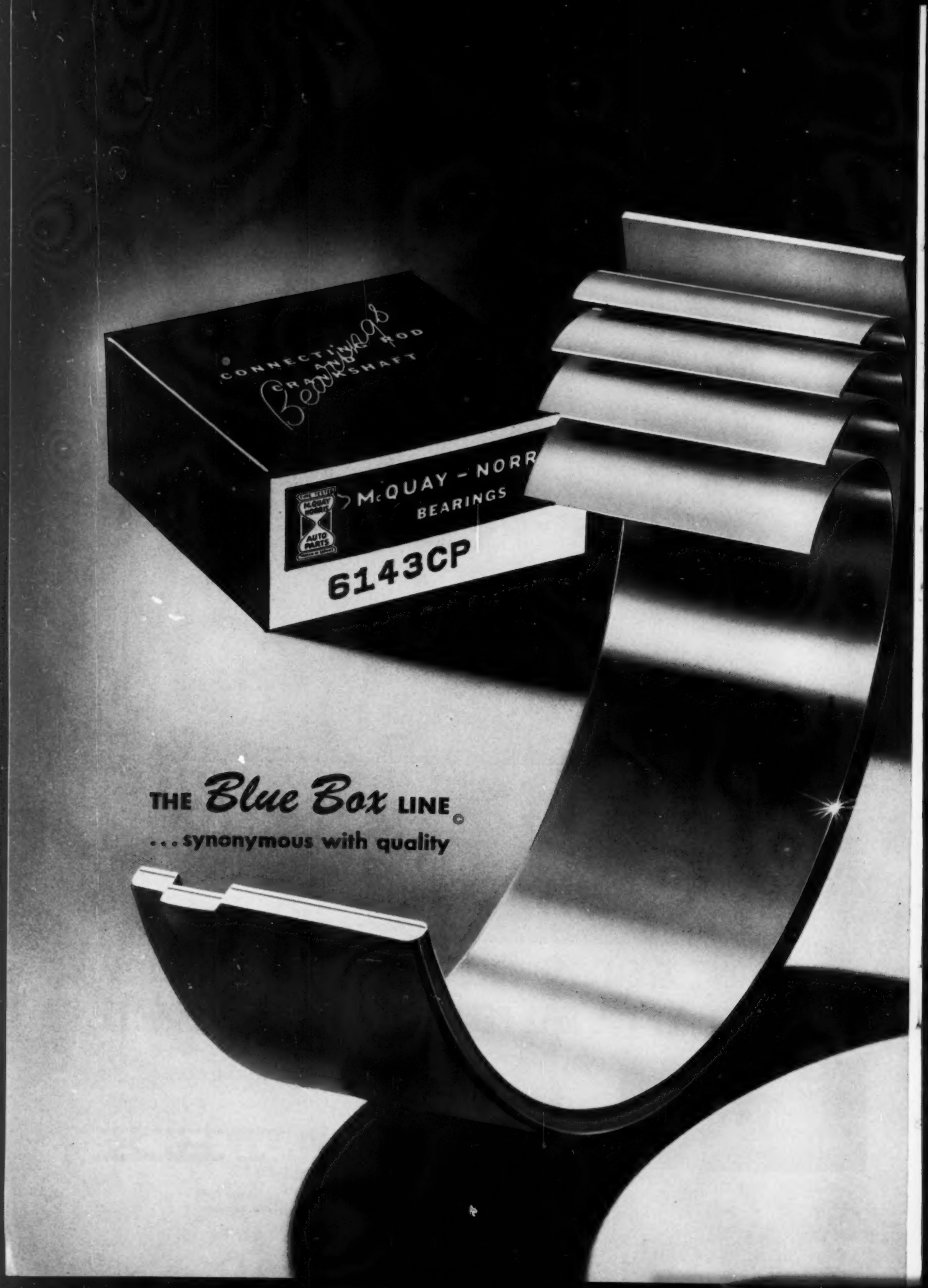
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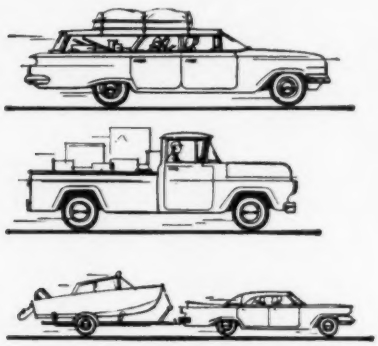

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VOLUME XLIX
No. 590

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March 1961

Automotive Service Digest

Cover Subject

Especially with modern unitized body construction, it is a help—in fact, a necessity—when correcting certain kinds of collision damage to use equipment for pulling. Several makes of such equipment are available to body shops.

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Technical help for the service shop

Tech Know-How **articles cover how-to and what's new in approved, up-to-date shop practices, as seen and understood by men experienced in the trade.** ***Business Know-How,*** **the dollar-sign side of automotive service work;** ***Service Education,*** **the who-what-where-how of today's trade training.**

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Automotive clinic

Stuck on some problem? Need help on a job? Write us about your problem on your SHOP LETTERHEAD to insure receiving the information you are looking for. The Automotive Clinic is exclusively conducted for shop operators and others actively in the automotive service business.

Address your letter to Automotive Clinic c/o AUTOMOTIVE SERVICE DIGEST, 900 So. Wabash Ave., Chicago 5, Ill.

Ben Ikert, Editor

The Ladies (God bless 'em)

This is not an S.O.S. for help, but I just thought some of the fellows in the field would get a kick out of a list I received from a woman customer when she brought her new car in for its 1,000 mile check-up.

(Name withheld on request)

- Shifting gear shakes like mad—can't get the darn thing in Park.
- Visor on right side won't stay up.
- Compartment door is tricky to open and even trickier to close.
- Glue down the cardboard in front of the rear window.
- Father said you have a new front seat for me.
- The plastic is in the back seat—PLEASE PUT IT ON SEAT WHILE WORKING ON INSIDE OF MY CAR.
- What is that horrible noise that I hear in the back when the gear shift starts shaking.

Elusive Knock

I read, with interest, the trouble one of your readers was having in locating an elusive knock on a 1959 Ford Six (Automotive Clinic, Jan., 1961, page 8).

Recently we had a somewhat similar experience with a 1960 Ford Six engine. When the car sat on an incline (front end high), or the front was jacked up, with engine idling, a very definite connecting rod bearing knock was evidenced.

As you know, the oil pan construction has a "reverse sump". When the front of the vehicle is raised, the crankcase oil flows to the rear or shallow end of the pan. The higher the vehicle is raised the deeper the oil becomes. The annoying knock occurs when the number six connecting rod strikes the oil. This could perhaps be the solution to E.P.'s problem.

H.M.K., Harrisburg, Pa.

Answer: Many thanks, H.M.K.—E.P., please take note!

Using Volts-Amps Tester

My volts-amps tester is a Sun model CB2 with the built-in ¾ and 1½-ohm fixed resistors and carbon pile load control. I also have the separate ¼-ohm resistor. I know that the ¼ ohm, used in series, is the accepted method, but if I do use the 1½ ohm contained in the VAT, will my readings be inaccurate?

Also, why would it not be possible to disregard the resistors and at the proper speed, adjust the load control to allow 8 to 10 amps to flow, and then note the voltage limiter setting?

I understand the importance of correctly testing and adjusting the voltage limiter since we are dealing in tenths of a volt, hence will appreciate any information you can give me. One last question, would the regulator points resistance test be applicable to all makes or Delco-Remy only?

J.F., Cleveland 5, Ohio.

Answer: The purpose of inserting resistance into the generator circuit when setting the voltage limiter is to be sure of a counter EMF equivalent to a fully-charged battery. Therefore, the ¼ ohm is used for this purpose. If the battery is fully charged, or with a gravity of 1.250 or better, it is actually not necessary to insert a resistance. Just be sure that the circuit is at normal operating temperature and the voltage is stabilized. Cycle the generator, then with a 10 ampere load on the generator check the voltage and make any needed adjustment.

The regulator points resistance test is applicable to all makes of points, since all make of points function in exactly the same way, namely making and breaking the primary ignition circuit.

Inches Hg vs. Inches H_2O

Today we hear of mechanics measuring the air restriction at the air cleaner by using the regular vacuum gauge, and it evidently works okeh.

This has been regular routine practice with diesel engine mechanics for quite some time, only instead of using the auto mechanic's vacuum gauge they use a gauge that measures in inches of water, which is said to be a lot more sensitive. I am also told that this same gauge is used to check the crankcase pressure.

Wish you would describe this inches of water gauge, and you may know of some formula whereby a mechanic can translate the reading of one gauge to the other. I am quite familiar with inches of mercury.

M.A.Q., Regina, Saskatchewan, Can.

Answer: Following the suggestions in your letter, we are now preparing a discussion of pressures, vacuum, inches of mercury, inches of water, etc., which we hope will answer the questions that many men in the service business may be wondering about. In the meantime, here is some brief information that should help you.

Water pressure may be used in the same way as Mercury pressure to in-

Take advantage of your Automotive Service Digest clinic. Countless other shopmen do—so why not you? Your participation is welcomed.

dicate either positive or negative pressure—that is, pressures either above or below atmospheric. One inch of mercury (Hg) is equivalent to 13.6 in. of water, or roughly 13½ times. One pound per square inch (1 psi) is equivalent to 2.3 ft. of water (H_2O).

For very low pressures, such as crankcase pressure drops or drops through air cleaners, a U-tube can be used, or a draft gauge for still lower pressures which may be measured in tenths of an inch of water.

To convert Mercury pressures to pounds per square inch remember, there is 2.03 in. Hg per pound per square inch, or 1 in. Hg equals .49 psi.

Car "Twists" Under Power

We have a 1958 Chevrolet Impala sport coupe equipped with 348 cu. in. engine, Powerglide, power steering, power brakes and four "summer tires."

Here is the customer's complaint: When you first step on the gas to speed it up, the whole car seems to twist on the road—the right front wheel pulling toward the ditch and the rear toward the center of the road. After the car settles down to an even speed it straightens itself up.

We have checked alignment (which is okeh), we tested the shocks and everything else that we believe would cause this reaction. Any suggestions?

H.G., Columbus, Pa.

Answer: With the front end in alignment, this leaves only dragging brakes, front wheel bearing too tight on one side, or possibly, if the car is so equipped, a defective locking differential. If the locking differential is not acting as it should, this might be the cause of the erratic action you describe.

A troublesome rear wheel bearing is another possible cause, and it might pay to check the power steering, as a leaking servo cylinder valve could cause such action under certain conditions. Also check the radius rods that hold the coil springs in alignment to make sure there is no looseness here to cause trouble.

Resistor HT Cable

I would like for you to settle a dispute between myself and my shop foreman. I say if a car comes out with a resistance core type cable that it shouldn't be changed to a standard type electrical cable. The particular car involved is a Chrysler product and the reason for changing was the fact that the terminal at the spark plug end was broken off.

Here's what I want to know: Will it affect the points and plugs and TV interference, or will it just affect TV? I say that if the car manufacturers had wanted that type of wiring on there, they would have put it on in the beginning, because it's less expensive.

H.J.S., Clara City, Minn.

Answer: The principal reason for using resistor HT cable is to minimize spark plug erosion to attain what is accomplished with resistor type spark plugs. The suppression supplied by the high resistance in the secondary circuit does extend spark plug life and allows the use of a somewhat wider spark plug gap. TV interference is a minor factor. It is certainly advisable to keep on using resistor type cables in systems originally designed for them because the particular coil and condenser used are designed for this type of cable.

You are correct in assuming that if the car manufacturers had not thought it was worth a little extra expense to put in the resistor wiring they would not have done so. Any time you change any important original specifications you are quite likely to get undesirable results as our modern engines are so precisely engineered that changing any of the items easily may upset operating conditions.

Looking for Equipment? Use our Classified Columns—Page 80

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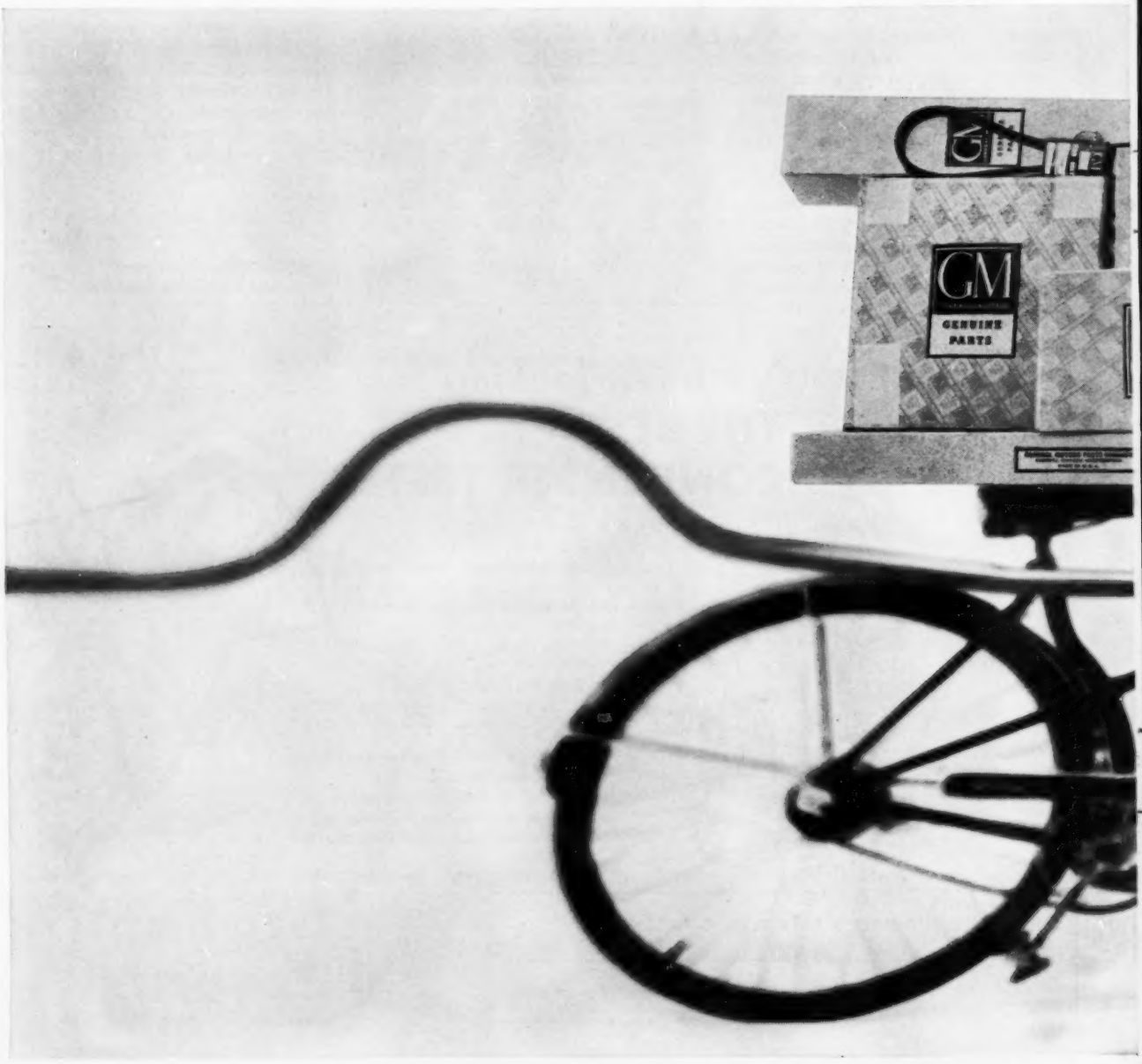

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By J. EDWARD SCHIPPER
Detroit Editor

Spokes from the "hub"

• INTERESTING RESEARCH and development is going on with air and fluid suspended bearings. Engineers at Chrysler Corp. have developed two unique air-lubricated bearings which hold possibilities for high-speed rotation. One of the Chrysler developments is a hydrodynamic or rotating-type cylinder, which generates its own air film when rotated at high speeds. The other is a hydrostatic bearing. This is made from a special porous sintered powdered metal through which pressurized air is used to form a lubricating film. U. S. Air Force research is particularly interested in these developments.

* * *

The new 1961 models of England's Land-Rover 4-wheel drive vehicles are now being shown by dealers in the United States and Canada. These vehicles are particularly adapted for travel in tough terrain. Tremendous traction is secured by four-wheel drive combined with a four-speed gear box and two-speed transfer, thereby providing eight forward speeds. Power takeoffs are available for agricultural, commercial and military needs including use of such equipment as compressors, snowplows, electric generators, winches and other special working units.

* * *

Atlas National Bonded Brake System of Detroit is marketing franchises for "while-you-wait" brake lining service. The company claims to have an economical method for servicing, maintaining and repairing automobile brakes which can be offered to the public at a savings of 25 to 50 per cent per car, depending on the make. It is also claimed that because of the advantages of the system franchise shops will be able to handle 50 per cent more cars per day than the average garage engaged in this type of work.

* * *

In a move to encourage greater use of safety seat belts, Chrysler Corp. is offering them to its dealers on a non-profit basis, and recommending that dealers make the belts available to owners of **all** makes of cars on a non-profit basis, with only a nominal charge being added for installation.

Commenting on the use of seat belts, Chrysler states that they markedly reduce the effects of accidents by keeping the car occupants in their seats, preventing them from being hurled about the car or thrown out on to the road or pavement. They also state that the American Medical Association has estimated that more than 10,000 lives could have been saved in 1960 out of the total highway death toll of approximately 40,000, if the car occupants had been wearing seat belts. California state police estimate that serious, critical and fatal injuries in all accidents could have been reduced by 35 per cent—and, there were 1,500,000 accidents.

* * *

Chrysler Corp. has formally announced its aluminum engine which has been out in the hands of dealers and owners for several months. This engine was mentioned in a review of aluminum engines in ASD last November. A six-cylinder engine with an aluminum block is now available in the 1961 Dodge Lancer. This cylinder block is die-cast and is offered only with the 145 hp, 225 cu. in. six-cylinder engine. Several thousand Lancers with this engine are presently in dealers hands, according to Byron J. Nichols, Dodge General Manager. The aluminum block reduces the weight of the engine by almost 65 lbs. Initial production of the new engine began at Chrysler Corporation's Trenton Engine Plant early in September 1960. Cylinder blocks are supplied by the Corporation's die-cast plant in Kokomo, Ind.

* * *

According to an AAA bulletin, when it comes to starting and pulling ability on glare ice, snow tires are 28 per cent better than regular tires; regular tire chains are 231 per cent better, while reinforced tire chains are 409 per cent better. On loosely packed snow, the snow tires are 51 per cent better than regular tires, whereas reinforced tire chains provide 313 per cent better traction.

As far as stopping ability is concerned under these conditions, reinforced tire chains have about the same advantage. For example, on glare ice, at 20 mph, braking distance for regular tires averages 195 feet whereas reinforced tire chains reduces this to 38 feet.

* * *

Tire guarantees are becoming more and more generous. For example, U.S. Rubber announces a new guarantee against blowouts, cuts, bruises and similar types of road damage. Under the terms of the guarantee, the company will either repair the damaged tire at no cost to the motorist or make allowance toward the purchase of a new tire, giving the motorist credit for the unused mileage remaining in the tire. Unused mileage is determined by measurement of tread depth. The life of the guarantee varies with the grade of the tire as follows: U.S. Royal Master 36 months; Butyl-ride 30 months; Super Safety 8, 27 months; Safety 8, 24 months; Safe-Way nylon 21 months, Rayon 18 months; Air Ride nylon 15 months, rayon 12 months; Winteride (mud and snow tire) 18 months.

* * *

Detroit is replacing its police patrol cars with station wagons to be used as the "work horse" vehicles for patrol duty. The Motor City has just placed into service 60 new Plymouth Suburban station wagons, replacing

conventional passenger-type vehicles for normal patrol work. The station wagons are equipped with two stretchers and first aid equipment and drivers are given refresher courses in first aid. The use of this equipment eliminates the need for officers calling in to headquarters or a hospital to get an ambulance—a time saver extremely important in many cases.

* * *

A new high performance engine has been made available by the Plymouth Division for Valiant passenger cars. The new engine, called the Super 225, is an overhead valve six rated at 145 hp. Its displacement is 225 cu. in., and compression ratio is 8.2:1. This compares with the standard engine of 170 cu. in. delivering 101 hp. Like other Plymouth and Valiant six cylinder engines, the Super 225 is inclined at 30 deg. and operates on regular gasoline.

* * *

Chevrolet has placed on the market a "Super-Sport" version of the 1961 Impala models. Distinctive styling touches, as well as a wide range of high performance options, will distinguish these special models. They will be available on all Impalas except station wagons. Power team choices for the "SS" models include: 305 hp. Turbo-Thrust Special V8 engine with either 4-speed synchromesh or high-performance Powerglide transmission; 340 hp. Turbo-Thrust Special V8 engine 4-speed transmission; or 350 hp. Super Turbo-Thrust Special V8 engine with 4-speed synchromesh transmission.

Included in the Impala Super Sport package is the following equipment: Heavy-duty front and rear springs and shock absorbers, special sintered metallic brake linings, power brakes and steering, 8.00 x 14 4-ply narrow band whitewall tires, color keyed instrument panel pad, and a 7000 r.p.m. electric tachometer mounted on the steering column.

* * *

An industry-wide study group has been named to evolve and recommend a program for coordinating efforts to attract, train and retain qualified automobile mechanics. Selection of the group followed a recent all-day session of auto industry service authorities called together by E. R. Stroh, vice president, of the Electric Autolite Co.

Serving on the group are representatives of the Automobile Manufacturers Association; National Automotive Dealers Association; Independent Garage Owners of America; National Congress of Petroleum Retailers; Automotive Service Industry Association, and Automotive Industry Vocational Education Conference.

Others of the 19 persons attending the all-day Detroit meeting included representatives of the car-manufacturers; Automotive Maintenance Association; U. S. Department of Labor and the Automotive Electric Association.

* * *

Oldsmobile is finding a higher demand for power steering on its 1961 cars. This factory option is found on 97.6 per cent of the company's full-sized cars, the Dynamic 88, Super 88 and 98. Driver steering effort required on Oldsmobile's "Roto-Matic" Power Steering never requires more than 2½ pounds of steering effort, even for parking, according to Oldsmobile engineers.

* * *

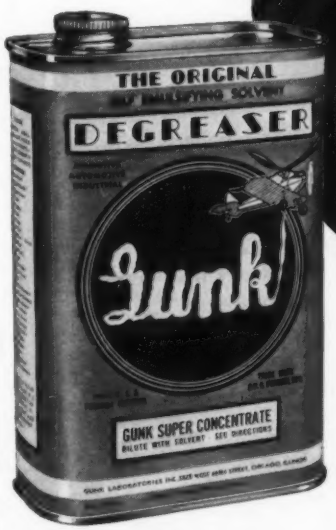
Ford Motor Co. employees received $824,430 during 1960 for ideas submitted under the company's employee suggestion plan. Last year's total increased to $7,674,026 the amount paid to Ford employees since the start of the suggestion plan in August, 1947. The overall total includes two awards of $6,000 each, the maximum established by the company in May, 1960, and 431 awards at the previous maximums of $1,500 and $3,000.

Of 50,665 suggestions submitted last year, 21 per cent, or 10,569 resulted in cash awards averaging $78, an all-time high.

Condensed Condenser Facts

A defective condenser can cause a lot of trouble in the ignition system. According to Champion Spark Plug Co., here's why:

- Wrong condenser capacity may cause pitted breaker points.
- High internal resistance may result in condenser failing to take a proper charge, causing arcing and burning of the contacts.
- If condenser "flashes over", the engine may miss under high compression.
- If internal insulation is bad, leakage can occur, causing breakdown of the condenser and complete ignition failure.
- An open or shorted condenser can prevent the ignition system from operating.
- A condenser tester offers the only means of accurately checking the condition of a condenser.



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steel-vent oil **flex-vent oil**

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Hastings Fire-Power Spark Plugs . . . engineered for replacement service . . . give premium performance, at competitive prices, with better profit for you.

Editor's page

Pull a wheel for safety's sake

• INCREASED HORSEPOWER, fast acceleration and greater top speed capability seem to be the demands of a large cross-section of the car buying public. Occasionally the factor of economical operation gets a break from car manufacturers, but, albeit, the design drive is largely on the performance factor.

Performance in itself is a desirable and even necessary factor to cope with modern automotive vehicular transportation. Actually, performance—speaking for the moment about the "oomph" in motor vehicles—can at times be a decided safety factor, and means of avoiding disaster.

But there's another and probably vastly more important kind of performance with which to reckon. It's the ability to safely and effectively slow up or stop the many tons of rubber-tired dynamite innumerable times a day.

It takes a lot more power to stop fast moving motor vehicles than it does to get them up to, for example, 60 or 70 m.p.h. That is to say, brakes are as great, or certainly as important a performance factor on motor vehicles as the "rarin-to-go" powerplants.

Some states have compulsory, periodic car inspection programs, but in spite of this there are too many cars in use the brakes of which have never been checked or are in dire need of service. Shops say that one out of every four cars inspected need some sort of minor or major brake service.

Many a driver relies on worn and neglected brakes to avoid accident only to find that they are not equal to do so. Often, these drivers are not aware of brake condition until involved in an accident.

Service station operators and shops, generally, are urged to tie in with the efforts of safety authorities to make motor vehicles capable of being efficiently braked. Car owners, many of them, must be shown. So, when there's evidence of mal-functioning brakes, pull a wheel for safety's sake. No customer will trust to luck, once shown the prevailing conditions.

Ben Ikert
EDITOR

Alternator design and structure

In contrast to the orthodox two-brush, DC-type generator which produces little or no current at engine idle speed, the increasingly popular alternator delivers between 4.0—10.5 amps. at idle, depending upon particular car or engine.

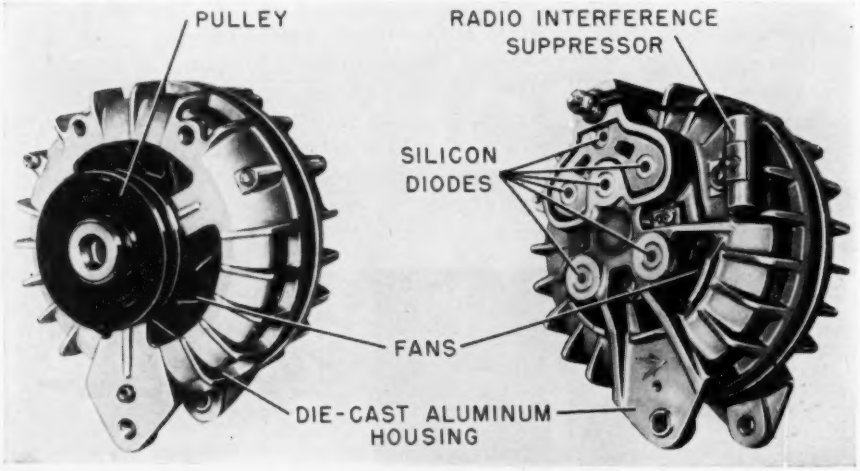
• THE CHRYSLER ALTERNATOR first introduced on the Valiant car in 1960 and now used on all 1961 Chrysler Corp. models, is one of the most interesting current developments for this season. The attractive feature about the device is that it is able to generate more current than the conventional standard D.C. generator at idle or low engine speeds. It has proven to be very reliable, while at the same time it is compact and light in weight. It is not entirely new, except for the fact that it is now available to private owners at a price no greater than the generator. It has been used for taxi cabs, police cars and other special purpose vehicles where a high current output at low speeds is particularly desirable.

Until this new design, now used on the various Chrysler built cars, it has had the disadvantage of being massive, heavy and expensive. In spite of this, however, where it has been required in the purposes mentioned, it has won a place for itself.

It is a well-known fact that the electrical demands on the automobile have been increasing at a rapid rate. Only a few years back the step was taken from 6-volt batteries to 12-volt in order to meet the wattage requirements with increased lighting capacity and various accessories which put a greatly augmented demand on the electrical system. In fact, it has been estimated that the electrical requirements of passenger automobiles have doubled about every ten years. Automotive engineers have fully realized this situation but the problem has been to get increased electrical output from the generator system without adding undue weight and cost out of all proportion to the output gain.

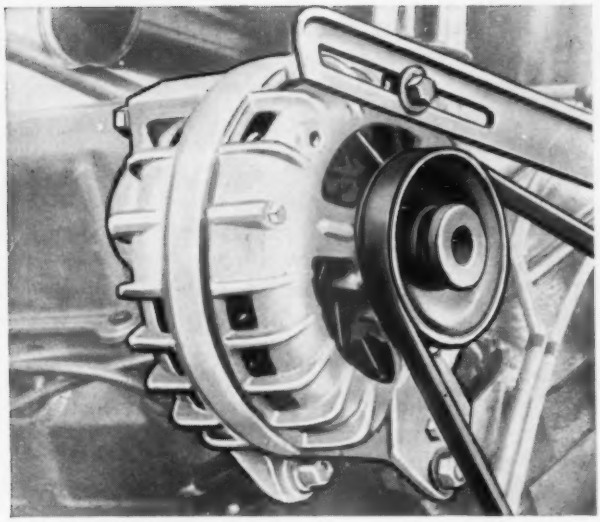
In view of this, a number of years ago Chrysler Corp. started an extensive program to design and develop an automotive alternator to replace the D.C. generator. The aims of this program were to develop a unit that would be: able to out-perform the same size D.C. generator; reasonable in cost; reliable but simple; and compact and light in weight. These goals have been accomplished in the present units.

The alternator's ability to generate more current

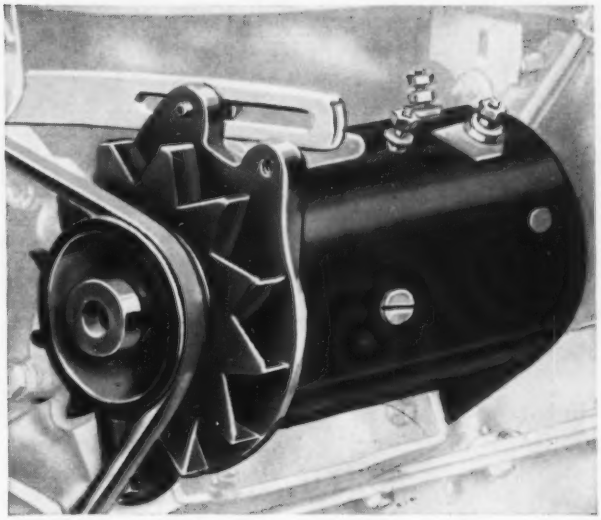


Exterior view of Chrysler's lightweight alternator which produces sufficient energy to meet the demands of the many accessories in an automobile. Circular silicon wafers, called diodes, permit flow of electrical current in only one direction.

By J. EDWARD SCHIPPER
Detroit Editor



How the alternator, complete with driving means and belt-tensioning device looks when installed on the engine.



Conventional DC-type generator such as the one shown above, is said to be about 30 percent heavier than the alternator.

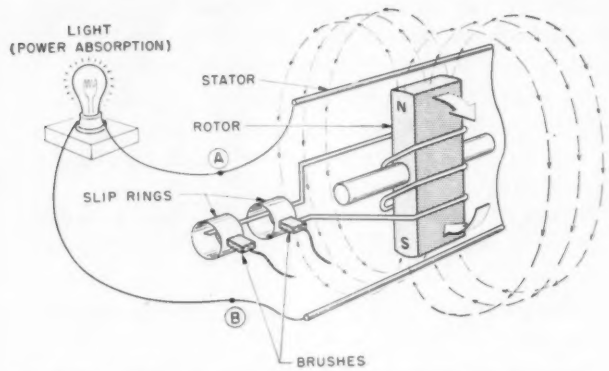


Diagram illustrating the operation of a simplified alternator. The basic principle of current generation involves relative motion between a magnetic field and a conductor causing induced voltage in the latter.

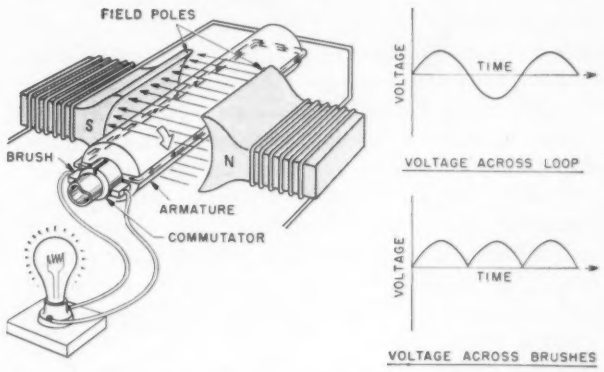


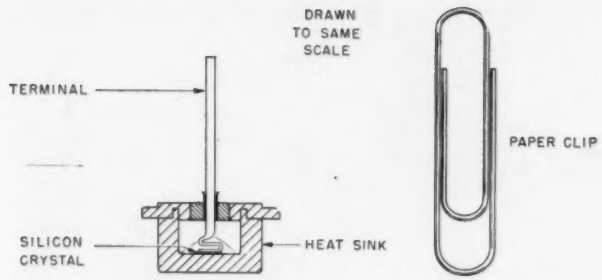
Diagram illustrating the operation of a simplified direct current generator. It consists primarily of a stationary magnet field and a rotating conductor or armature. The armature is mounted between the field coils.

at low engine speeds shows up at a great advantage in stop-and-go winter driving. Under these circumstances with the heater, windshield wipers, headlights and radio all operating at the same time, plus the reduced efficiency of the battery in cold weather and the extra drain needed by cold-weather starts, a discharged battery and a helpless motorist can readily result.

Contrasted with the conventional D.C. generator that usually does not produce any current at all when the engine is idling, the alternator will deliver between 4.0 and 10.5 amperes (depending upon the car and engine) at idle.

This advantage, of course, has been long realized by automotive engineers. The problem, of course, came down to producing these results at a reasonable figure with no cost penalty to the car buyer. A big part of the answer to this part of the problem was solved by the electronics industry which worked with Chrysler to develop a new silicon diode. This is a key part to the Chrysler alternator and takes the place of the bulky and expensive selenium rectifiers used on the special equipment alternators mentioned above.

As explained in ASD issues of February and December, 1960, generating electrical current in any form of generator depends upon magnetism—or to be more specific, invisible lines of magnetic force. These invisible lines of magnetic force emanate from the magnet at its north pole and cross to the south pole. These lines of force constitute the magnetic field. Whenever a wire or a coil of wire is moved through a magnetic field or in reverse, if a magnetic field is moved across the wire, so that the lines of force are cut, a voltage is developed in the wire. When this wire is connected to an external circuit, current will flow. The amount of voltage generated will depend upon the number of lines of magnetic force which are cut, the number of turns of wire in the coil and the speed at which the wire passes through the lines of magnetic force. The magnet could be either a permanent one or one



Essential ingredient of the alternator is a tiny silicon wafer or crystal called a diode. It is from .005-.008 in. thick. Six wafers placed in heat sinks are used in the Chrysler alternator.

which is produced by passing an electric current through a wire which is wound around an iron core. When this is done, the magnet created is known as an electromagnet.

TRADITIONAL D.C. GENERATOR

The traditional D.C. generator consists basically of a stationary magnet field and a rotating conductor. In its simplest form, the conductor consists of a loop of wire wrapped on an iron core—the assembly being called an **armature.** The wire loop is then attached to two copper segments (termed **commutator**), which are insulated from the iron core and from each other. In order to carry the generated electrical current from the armature, a carbon **brush** is placed on each side of the commutator. Finally, the armature is mounted between the **field coils** so that it is in the magnetic field set up by these coils.

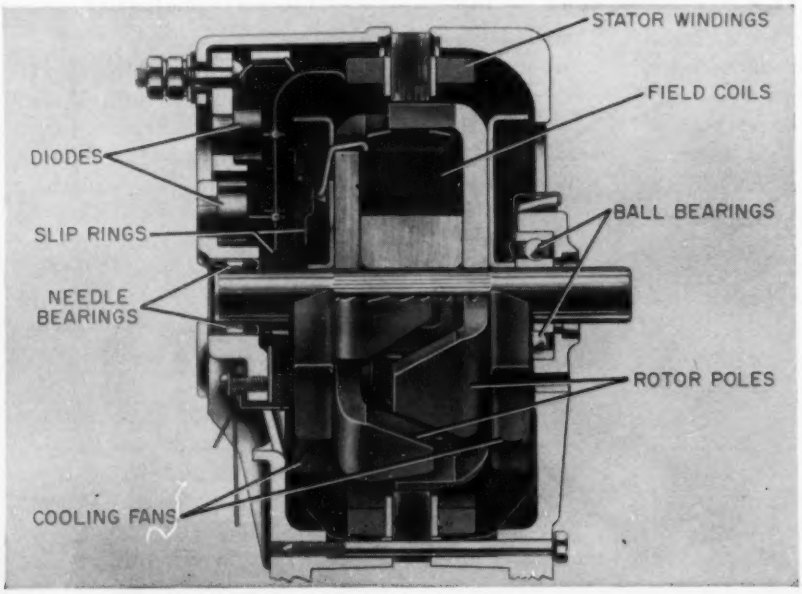
As the armature is rotated, by means of the generator pulley, the wire loop cuts through the magnetic lines of force being sent out by the field coils. This cutting action causes an electrical current to flow in the wire loop when it is connected to an external circuit. The amount of voltage generated at any instant will depend upon the number of lines being cut in each small increment of time. At the instant when the loop of wire is horizontal (as shown in the illustration) a maximum voltage will be generated in the direction shown. A quarter of a revolution later, zero voltage is generated. When the loop rotates still another quarter of a revolution, a maximum voltage will again be generated but in the opposite direction. Thus the voltage generated in the wire loop is a reversing pulse-like cycle. When the wire loop is connected to an external circuit, current will also flow in a reversing cycle, which is known as **alternating current** (or A.C.)

Because the automobile electrical system uses direct current, some method of changing this alternating current to direct (non-reversing) current is required. This is where the commutator and brushes come into the picture. Together, they act as a mechanical reversing switch which allows the electrical current to flow out of the same brush and into the battery in the same direction all the time.

In reality, however, an automotive generator having only one conductor would not produce enough output to be useful and therefore many conductors (connected end to end) are used for each coil, and several coils and commutator segments are required for the armature. This results in a useful direct current output.

Now, look at a few of the conditions that are inherent in a D.C. generator:

First of all, the commutator is a complex assembly. It is made up of 28 individual copper bars separated by 28 thin pieces of insulating material. As these separation joints come into sliding contact with the brushes, a brush wear problem is created.



Alternator cross-section. The diode (or rectifier) is a crystal of silicon which is a semi-conductor material (good conductor of current in one direction). In this respect, it is similar to a radio transistor.

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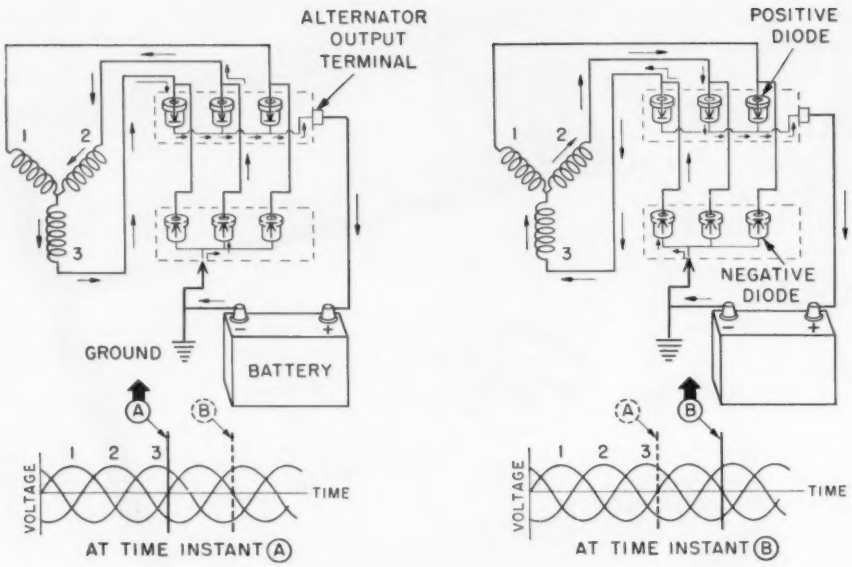


Three sets of windings are used in the Chrysler stator, one end of each winding connected to a common junction called a "Y" connection. Output of the alternator is taken off the other end of each of the three windings. The alternator is referred to as a 3-phase "Y"-connected stator.

Furthermore, the brushes must carry the total output of the generator and as such must be of the proper size and material to provide a low-resistance sliding connection.

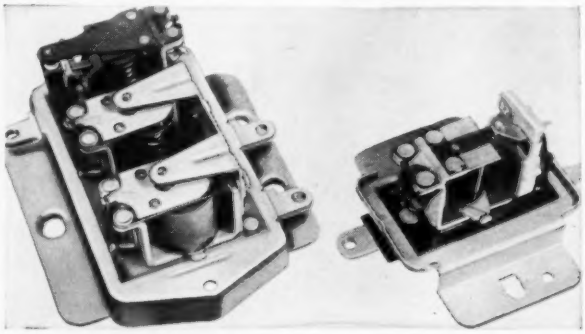
In the application of a D.C. generator to a vehicle, the drive ratio between crankshaft and generator pulley is usually a compromise. A high ratio is desirable so that the generator will rotate faster, cut lines of force more rapidly, and thus provide output and idle and slow stop-and-go city driving. For continuous high-speed usage, such as turnpike and expressway driving, a low generator drive ratio is required to reduce the rotational speed of the generator and thus reduce wear. If all vehicle usage could be put simply into one or the other of these two classes, finding a generator drive ratio for each type would not be a difficult job. However, since most automotive usage requires both features, a compromise is necessary.

Now having reviewed the operation and problems associated with the D.C. generator, look and see how an alternator functions and how it can improve the situation.

ALTERNATOR (OR A.C. GENERATOR)

The basic principle of electrical generation for the alternator is the same as for the D.C. generator —relative motion between a magnetic field and a conductor causing a voltage to be induced in the conductor. In a D.C. generator, the magnetic field is stationary and conductors are moved so that they cut across the lines of magnetic force. In the Chrysler A.C. generator or alternator, the magnetic field is moved so as to cut across the stationary conductors. The direction of flow of the electricity in the conductor will depend on whether the lines of force cut the conductor as they come out of one end of the magnet (north pole) or as they pass back into the other end of the magnet (south pole).

In its simplest form, the stationary conductor of the alternator consists of a loop of wire wrapped around an iron core—the assembly being called a **stator.** The moving magnetic field is created by rotating an electromagnet, called **rotor**, inside the loop of wire. The ends of the wires to the electromagnet are attached to **slip rings** which rotate with the motor. To supply current to the electromagnet, two **brushes** are placed in contact with the slip rings.



The regulator at the left is used with DC generators; the one at right, for alternators. Unit at right is more compact and requires only one relay, termed the voltage regulator unit.

Up to this point, the simplified rotor has been considered as a bar or two-pole electromagnet. The rotor of the Chrysler alternator consists of many turns of wire (termed field coil) located inside two interlocking pole pieces. Each of these pole pieces has six poles, providing a total of twelve poles for the complete rotor assembly.

The simplified alternator having a single loop of wire is called a single-phase alternator, regardless of the number of turns of wire in the loop winding. Or to rephrase this, when all the windings in the

(Continued on page 44)

Reference to a reliable flat rate manual at all times is one of the shop's guarantees of operating in the black. It helps in determining . . .

The right price for service work

By E. S. HARRIS

• THERE ARE MANY TOOLS necessary to the automotive service industry, be they "general purpose" for many jobs, or "special purpose" for the unusual. But whether standard or special, there is one tool necessary to every job, the **Flat Rate Manual.**

For those who grew up with the service industry it might seem surprising that the subject of flat rate could warrant discussion, but in flat rate, like so many service operations undertaken in these modern days, the background for the sequence of steps taken to do the work have become obscured by time.

To newcomers to the trade the service operations are merely a series of "proper" shop practice rules learned from a book or by word of mouth. That each one of these steps were born from skinned knuckles, come-backs, or bankruptcy is completely lost on them unless they question them enough to try and do them "their way."

In the early years of the industry the car owner's question of, "How much?" was answered by the mechanic's, "Depends on how long it takes." And the idea of a "come-back" where the mechanic corrected some of his mistakes without charge was unheard of. If the mechanic spent another couple or three hours on the job that didn't pan out the first time, then the mechanic was paid for the additional time by the customer. Whoever heard of "satisfaction guaranteed"?

HOW MUCH WILL IT COST?

However nice it would be to separate service skills from economics, it simply isn't possible, so the question of "how to fix it" is always immediately followed by "how much will it cost." Since this is part of the law of economics, then, every book telling how to fix it must be accompanied by a book telling how much to charge for the job. People are inclined to buy pigs in a poke, and when they are forced to, they are inclined to squeal louder than the pig if the grand total on their bill is too much of a surprise.

There have been a lot of arguments in the name of "Flat Rate," and it was never more maligned by the customer who considered it "too high," than by the mechanic who believed it to be "too low." As a matter of fact there were times when it was both. Some operations were timed so that nobody but a speed merchant, and maybe a dishonest one

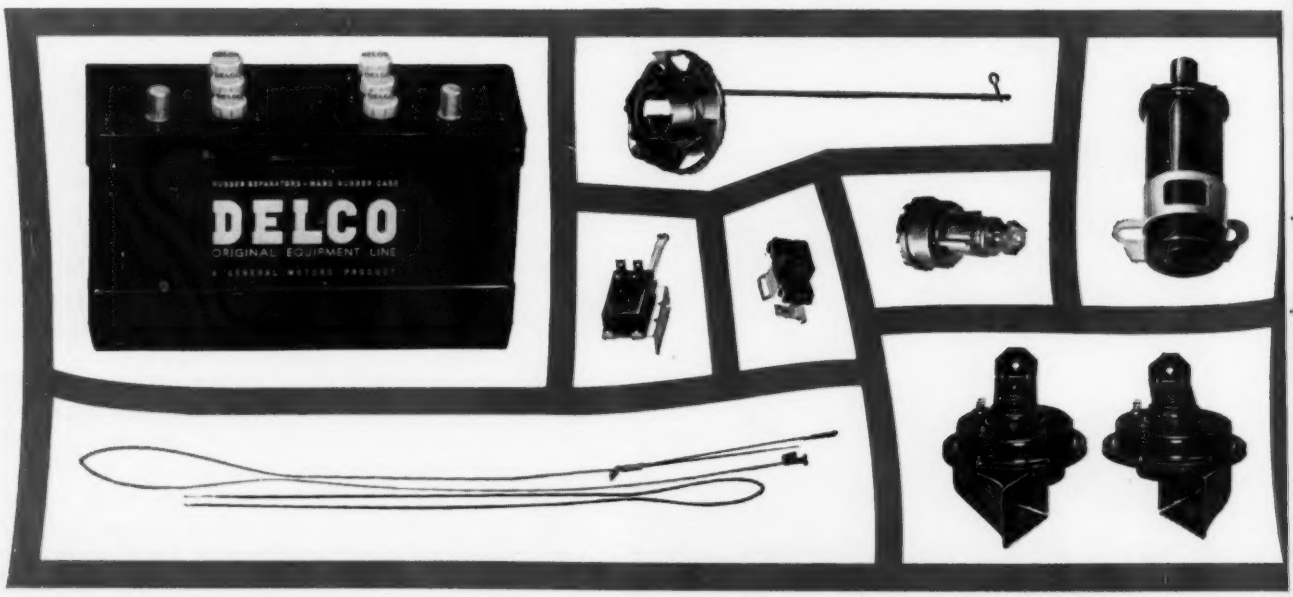
(Continued on page 48)

Corvair by Chevrolet

Tempest by Pontiac

...electrical systems

Delco-Remy systems provide electrical energy for the needs of motion in General Motors new size cars, too. Special electrical systems were developed by Delco-Remy working closely with Chevrolet, Pontiac, Buick and Oldsmobile. In all four new cars, these lighter units deliver the same kind of reliable high performance that has been built into Delco-Remy electrical systems for over fifty years.



Special
by
Buick

F-85
by
Oldsmobile

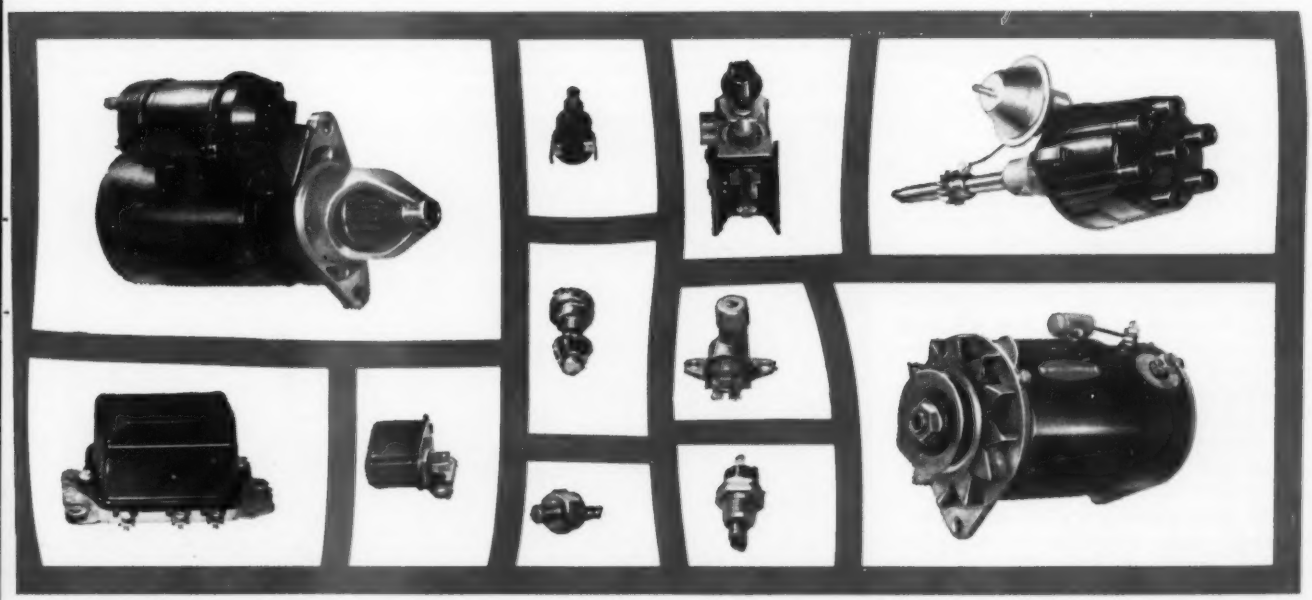
by Delco-Remy

Delco-Remy equipment for the Corvair, Tempest, Special and F-85 includes • Generators • Regulators • Cranking Motors • Distributors • Ignition Coils • Horns • Flexible Cable Controls • Directional Signal and Control Switches • and Delco Batteries.

Delco-Remyelectrical systems

From the highway to the stars

DIVISION OF GENERAL MOTORS, ANDERSON, INDIANA



BODY REPAIR . . . REFINISHING . . . GLASS . . . TRIM

The body shop

APPEARANCE MAINTENANCE

Damage Diagnosis and Correction

• SUPPLEMENTING MATERIAL and illustrations dealing with the principles of body-frame straightening, and which appeared in the February 1961 issue of AUTOMOTIVE SERVICE DIGEST, this article discusses further these principles. Also presented in this month's article is a series of photographic reproductions showing the repairs made on a 1960 Corvair which had been rolled. A body shop began repairs to the roof and door panels, but when misalignment persisted the car was brought into the shop of the Bear Manufacturing Co., Rock Island, Ill., for further diagnosis and corrective measures.

The procedure on this job followed closely the basic principles of body-frame straightening as covered in last month's "body shop" article. However, there's more to body-frame straightening than can be adequately covered in one issue. Consequently, we shall give our readers a few more of the basic principles in this month's issue, together with a discussion of the repairs as they were effected on the previously mentioned Corvair.

APPROACH MAY VARY

While the procedures for correction apply primarily to the equipment manufactured by Bear, it is felt that the general principles can be substantially followed by shopmen having similar equipment. The method of approach may vary, due to detail design of equipment, but with certain modifications, the overall desired results should be forthcoming.

To make it easier to place frame centering gauges, hook-ups and straightening procedures, the damaged car must be raised off the floor, at least to the height of safety stands. Then the car is positioned on the shop floor so that the damaged areas are easily accessible and allow ample working space. Tubular support bars should be slid through the safety stand heads and positioned under the car; one at the cowl area, one at the rear door area. Position the safety stands outside and away from body panels.

With equipment mentioned in this article two tubular support pinch-weld clamps are attached to a unitized body, one on each side of the vehicle. Clamps are positioned so the tubular support bar will pass through the eyelets squarely. The use of the pinch-weld clamps supports the body above the tubular support and provides a hold-down and/or hold-back attachment. When the clamps are used for attachment purposes, they generally are positioned at the end opposite the damaged area; that is, with damage occurring at the front of the car, the pinch-weld clamps are positioned at the rear door area.

DIAGNOSING BODY-FRAME DAMAGE

With a set of four frame centering gauges and a 6 ft. tape measure practically all types of frame misalignments are easily determined and measured. Datum line measurements are made by datum-line fixtures attached to each centering gauge leg. The gauges can be attached to either box or channel type frame constructions. Gauges are placed at corresponding points on the inside or outside of the frame siderails.

In the case of the Corvair, shown

This car had been rolled with major damage to the roof and door panels. A body shop tried to pound out the roof and left door panel, but could not match door and roof lines. Sideway and lower body damage also had to be corrected with suitable equipment.

herewith, frame gauges hung with plug and magnetic adaptors, were placed at the cowl and rear door areas and rear bumper support brackets. They showed a 1" rear sidesway. The roof was damaged and the left front door post had dropped.

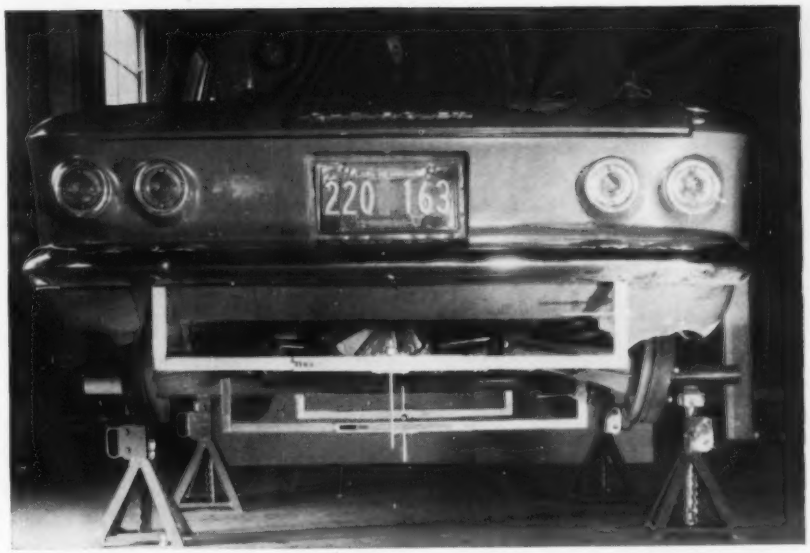
When frame gauges are in place the body man sights the three pointers, located at the center of each gauge, for alignment. The best procedure is to align the pointers of the No. 2 and 3 gauge, then determine the direction of sidesway and the amount from the pointer of the first gauge.

To help in determining the amount of sidesway, the pointers are ¼" in diameter. All three pointers will be in exact alignment in the absence of sidesway. The frame centering gauge pointers are self-aligning and will automatically indicate the center of any frame.

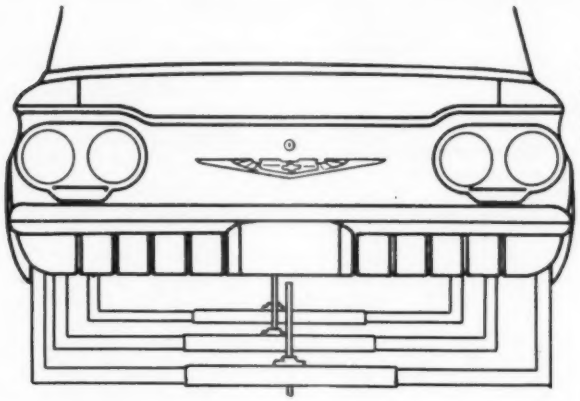
For checking the rear section of the frame for sidesway, the fourth gauge is installed at the crossmember behind the car's fuel tank. Then the shopman sights the pointers from the rear to determine rear end sidesway. The method of coping with sidesway, using portable type of straightening equipment is shown graphically in the illustrations with this article.

An excellent feature of this particular equipment is an adjustable-height pull-yoke assembly on the upright beam. It affords these pull combinations: (1) continuous 10" pull at pull yoke with assembly at any height and upright tower stationary; (2) double stretch and pull, decreasing or increasing pressure simultaneously or independently with the tower upright; and (3) pulling with the upright beam while independently controlling upper and lower pull with second and third jacks.

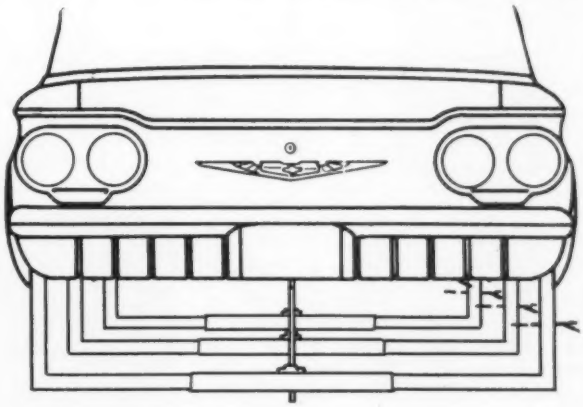
There is a sliding bar attachment on the main beam to make pulls from inside the engine compartment, conventional or rear mounted, without removing the engine. For heavy pulls the apparatus provides pull-rod metal-



This shows the damaged car with wheels removed and placed on safety jacks. Frame gauges are hung with plug and magnetic adaptors. Gauges showed 1" rear sidesway, readily visible in the illustration.

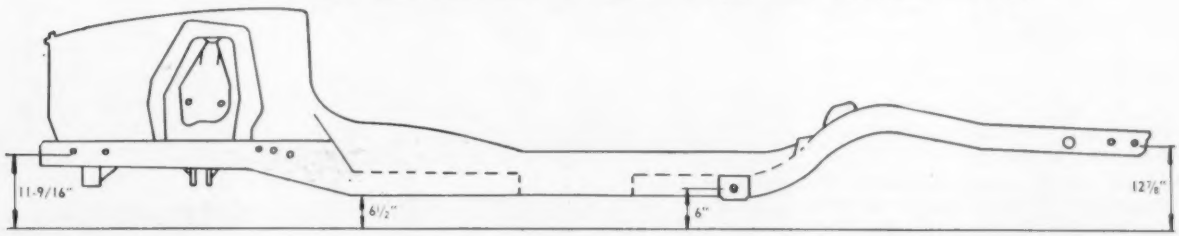


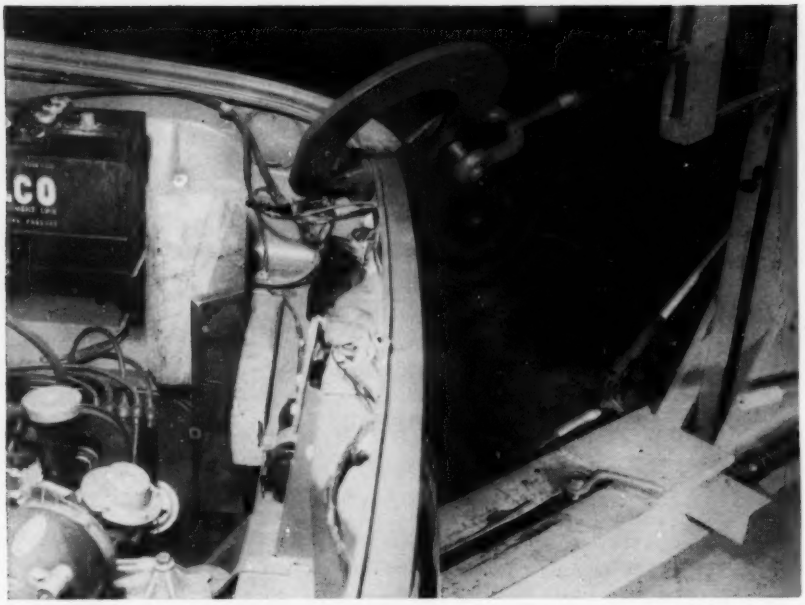
Three centering gauges will check misalignment when a car is struck in front.



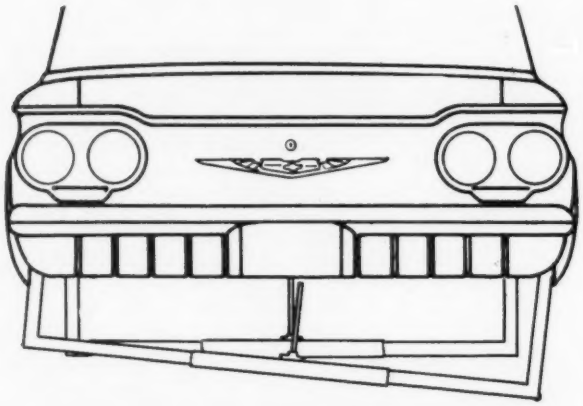
Datum line check. Gauges are at location of measurements such as shown in illustration below.

A datum line is an imaginary horizontal level line appearing on frame blueprints to determine correct frame levels. Vertical measurements are taken from specific frame points to this line.





Close-up of engine compartment hook-up. Wood blocks cushion the lower frame pull. Throat hook is attached to pull yoke by rod for upper body single, or simultaneous pull.



Frame centering gauges are placed at certain positions to check for sag if car is struck in the front.

to-metal hookups instead of chains for greater safety and rigidity.

CHECKING FOR SAG

Three centering gauges are used to check for sag when a car is struck in the front. One gauge is placed at the front crossmember, one at the cowl area and one at the rear door area. To determine which side of the vehicle and the amount of sag at the cowl area, the operator sights along the bottom bars of the first two frame centering gauges only. Both bars should be horizontally in line with each other. Sag is located on the side behind the high corner of the front gauge. To aid in determining the amount of sag present the gauge bars shown in this article are 1" wide.

Because of the assumed angle of the front pointer it is difficult to determine the exact amount of sidesway when a damaged car has both side sway and sag. Consequently, the low corner of the front gauge should be raised until the pointer is perpendicular. Following this procedure will aid the operator to determine the exact amount of sidesway when sag also is present.

To check for sag at the rear door area when collision damage occurs at the rear of the vehicle, the fourth centering gauge is placed on the frame *ahead of the mash condition.* When checking sag at the rear the frame centering gauge is not placed at the crossmember behind the fuel tank. A mash frame condition over the rear end housing will interfere with a true sag reading. When sighting from the rear of the car the bottom bars of the first two centering gauges should be horizontally in line with each other. As in the case with front sag, sag at the rear is located on the side behind the high corner of the front gauge.

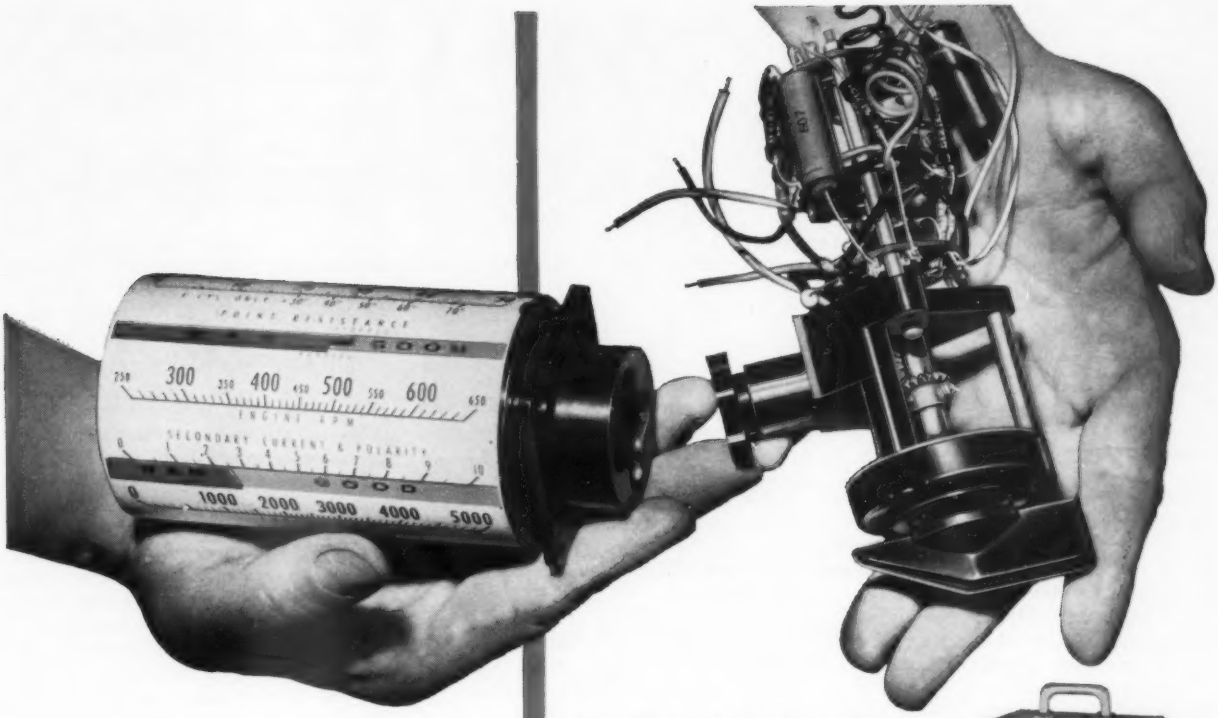
DATUM LINE CHECKING

Sag occurs at either the cowl area or rear door area and usually on one side of the vehicle. However, a head-on collision occurring in the front or rear could cause both frame siderails to sag. During frame correction procedures it would be difficult to determine the correct height of the frame at these areas, as well as the arch of the frame over the front suspension or rear end housing. It is necessary in such an event to make a datum line measurement, making use of the datum line fixture of the frame centering gauges.

The term datum line refers to an imaginary horizontal level line appearing on car frame blueprints to determine correct frame levels. Vertical measurements are taken from

(Continued on page 26)

Shown below is the complete hook-up for correcting sidesway. In this instance no amount of upper body work would have returned the car to correct specifications.



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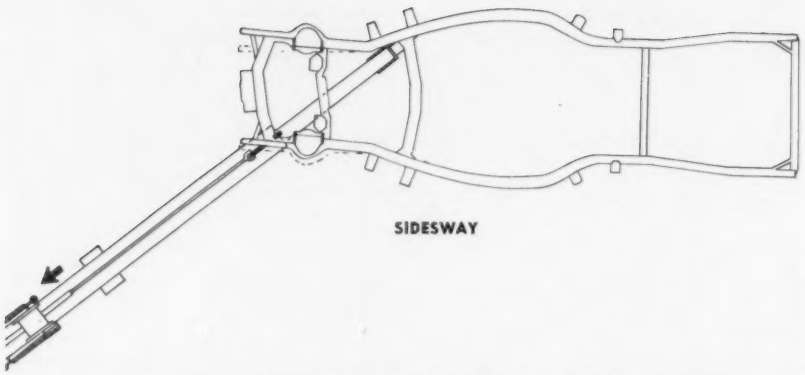


SIDESWAY

Top view of frame straightening equipment showing the method of application to a conventional type car frame. Sidesway is correct when pointers on the frame centering gauges are in line.

specific points on the frame to this imaginary line. To check the datum line the frame centering gauges are placed at the locations of the vertical measurements indicated on the blueprint. Then the datum line fixtures located on the legs of the gauges are slid to equal the given vertical measurements. The operator then sights the datum line pointers. All of these pointers are in alignment when the datum line is correct.

MASH FRAME CONDITIONS

Mash frame conditions occur directly behind the front crossmember or directly over the rear end housing. It is a condition which is readily visible by the appearance of buckles on the underside of the frame siderail. A mash will always result in a shortness of length of a frame siderail.

For ascertaining the amount of mash when a car is struck in front the operator measures from a point at the front crossmember to a point on the frame at the cowl area. Measurement is made from the holes provided in the frame or rivet heads. These measurements are transferred to the opposite siderail, the difference indicating the amount of mash.

When a car is struck in the rear, measurements are conducted from a point at the rear door area (usually a spring hanger) to a point at the end of the frame. Should a car be struck headon with mash occurring at both siderails, the operator must refer to the frame blueprints and car makers specifications.

DIAMOND SHAPED FRAME

When the condition exists, diamond is always measured at the center section of the frame between the cowl area and the rear door area. If this procedure is followed it will eliminate the interference of the other collision damage (sidesway, sag, mash) from obtaining accurate measurements. The measurement is a diagonal or "X-ing" kind through the center section of the frame. The longer measurement of the two indicates the siderail that has been pushed back.

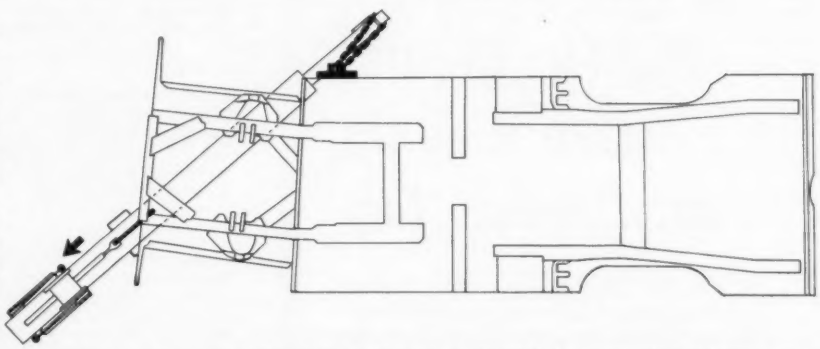
TWISTED FRAME

A twisted frame is checked by placing two centering gauges at the center section of the frame, one at the cowl area and one at the rear door area. For determining the direction and amount of twist the operator sights along the bottom bars of the frame centering gauges. Both gauges must be parallel or in line with each other in the absence of twist.

PREPARING DAMAGED VEHICLES

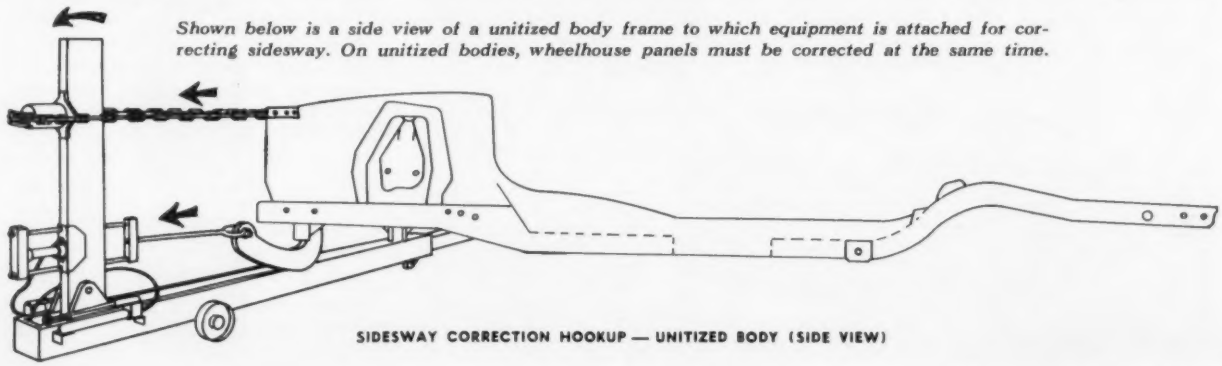
When all body-frame damage has been determined and recorded the operator next prepares the damaged vehicle for straightening. Not all collision damages are alike nor require the same preparatory procedures. However, the material and suggestions which follow apply in general to the work of straightening frames for both conventional frame construction vehicles and unitized vehicles. In this connection the Bear company suggests the following:

Conventional Frame Construction — Remove wheels, bumper and metal work that interfere with frame correction and installation of equipment attachments. Do not remove or loosen body bolts. Remove suspension as-

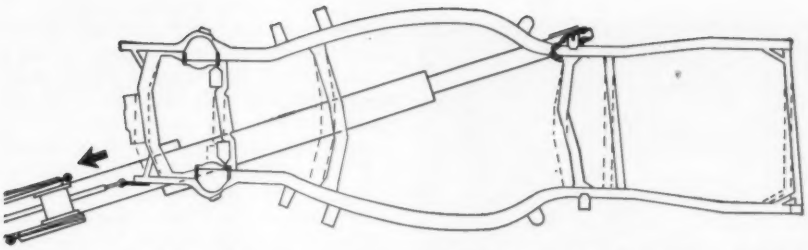


Top view of frame straightening equipment as applied for correcting sidesway on a unitized type of vehicle. If placed outside the frame a chain attaches it to the car.

Shown below is a side view of a unitized body frame to which equipment is attached for correcting sidesway. On unitized bodies, wheelhouse panels must be corrected at the same time.



SIDESWAY CORRECTION HOOKUP — UNITIZED BODY (SIDE VIEW)



Correction set-up for straightening a diamond-shaped frame. In this case one siderail may be held while the other is pulled into position.

sembly or assemblies. Clean the frame at the buckled, cracked area with a wire brush. Weld all breaks in the frame to avoid further tearing of the metal while the frame is being straightened. Rough out damaged frame horns in preparation for installing hook-ups.

Unitized Vehicles:—Remove bumper and metal work *only* if found absolutely necessary. (Straightening unitized cars require that all component parts remain as part of the vehicle. The purpose is to gain as much support as possible as pressure is applied while straightening both the body and reinforcing structures). Remove suspension or assemblies. Clean frame and panels at buckled or cracked areas. Weld breaks, frame and panels to avoid further metal damage while straightening is being done.

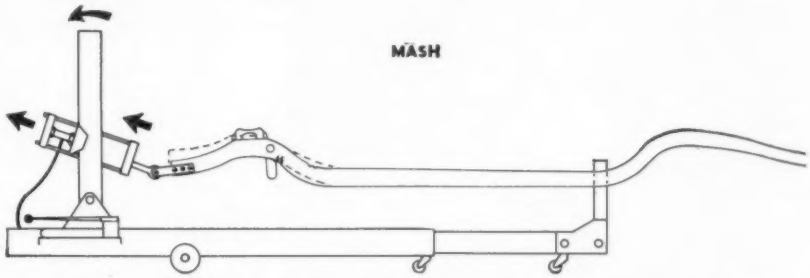
BODY FRAME STRAIGHTENING

Basically speaking, body-frame damage is removed in a direction opposite to that of the impact which originally cause the damage. Bear, in its method for straightening body frames follows a pulling rather than a pushing procedure. The method also minimizes the use of heat and follows a cold-work principle of straightening body-frames.

The company emphasizes that its portable straightening unit provides the operator with practically unlimited pressure at his command. Consequently the operator is more or less responsible to prevent body panels and/or frame from tearing while "pulling" it out. This is accomplished as far as possible by using a hammer to relax the buckles until a point is reached where a silver streak begins to appear in the heart of the buckle. At this point, heat (neutral flame, large tip) is used to heat the buckled area to a cherry red. If needed, additional pressure and heat can be applied.

To allow for spring back during the straightening procedure frames should be over-corrected. The amount to pull past a given point is best determined by actual experience with various types of frames. It is said that unitized construction does not require as much over-correction as conventional frames.

Body damage should be corrected at the same time as the frame is being straightened. Thus, it is advantageous to get the assistance of a body repair man during the straightening process. The two working together will save time and effort and it helps in relieving strains on both the body and the frame. This makes it easier to align body panels.



Mash is corrected when both siderails between the front crossmember and the cowl area have equal measurements. A mash condition in the rear uses the same hook-up

A versatile deep throat hook, with a long wood cushion is being used here for a high pull at the roof channels. A clamp under door post is used for a hold-back on the left side.

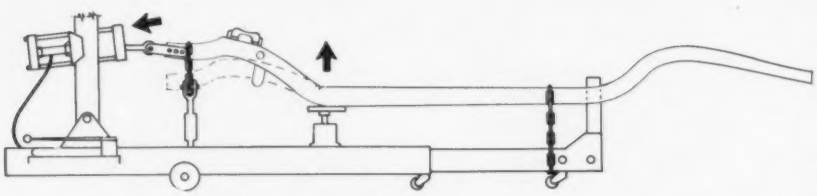
The first hook-up to be attached to a damaged car is a stretch-and-pull hook-up on the side having the greatest damage. It serves as a basic hook-up used to remove other types of frame misalignments excepting that of twist.

To help the frame operator to correct various types of misalignments the following is given to serve as a guide.

Diamond—This is the first type of misalignment to correct. The operator extends the main extension beam to its full length and positions the portable aligning equipment under the vehicle so that one siderail may be held while the other is pulled into position. During the straightening procedure "X-ing" measurements conducted at the center section of the frame will determine when correction is completed. A ½" frame diamond necessitates pulling the one siderail only ¼" to bring the "X-ing" measurement equal. As one siderail is pulled the other is forced rearward.

Here is shown the completed straightening job as indicated by alignment of centering gauges. Final body work, recheck with gauges and a trip to the paint shop restored the Corvair to a like-new appearance.

Mash—The next frame condition to be corrected is mash. With the equipment featured in this article the operator merely removes the diamond hold-back hook-up and swings the end of the portable equipment over to the same siderail to which the stretch and pull hook-up is attached. Mash is corrected when both frame siderails between the front crossmember and cowl area have equal measurements. A mashed condition occurring in the rear requires the same type of hook-up except that it is reversed. Removing mash on unitized constructed vehicles is done as given in the following paragraphs.



Sag is corrected when the bars of the three frame centering gauges are parallel. For unitized construction cars, mash and sag are treated as one.

Sag—Especially with unitized constructed vehicles it is difficult to determine which conditions, mash or sag, appears first in regards to the order of occurrence of collision damage. Generally speaking, mash and sag are removed together as applied to all vehicles.

To install the hook-up a 12-ton jack is placed on the main beam of the aligning equipment at the cowl area. By means of chains the frame siderail is tied down, one just ahead of the front crossmember and one at the rear door area. To utilize the greatest leverage the positions of the chains in relation to the jack may be seen in an accompanying illustration. A stretch and pull hook-up is used in connection with the sag hook-up wherever sag exceeds $\frac{3}{8}$".

Padding in the form of steel plates always is used between the jack head and frame and between chains and frame, to prevent the frame from crushing when pressure is applied. Sag is corrected when the bars of the three centering gauges are parallel.

For unitized constructed cars sag and mash are treated as one. Sag and mash collision damages are corrected by means of two stretch and pull hook-ups, one attached high on the wheelhouse panel, the other attached to the frame. The double stretch and pull hook-up permits both the body panel and the frame to be pulled and aligned together. Of the two pulls the wheelhouse panel pull is considered to be the "lead" jack. That is, greater pressure will be applied there than at the frame. Jacking up at the cowl at the same time will remove sag.

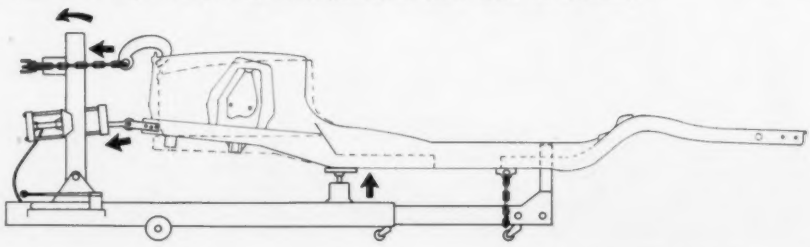
To avoid creasing the roof panel the front is not tied down as practiced with conventional frame construction vehicles. The padding for unitized vehicle correction should be wood. Wood offers greater protection to the body panels and frame panels.

Sidesway — After diamond, sag and mash have been corrected, sidesway is the next type of misalignment to be straightened. To do this the operator removes the hold-down and hold-back hook-up, as well as the sag jack, and rolls the end of the portable aligner over to a diagonal position shown in one of the illustrations. The anchor upright which serves as the holdback may either butt against a crossmember or extend outside the frame. If placed outside the frame a chain is used to attach it to the frame at the cowl area. Sidesway is correct when the pointers of the centering gauges are in alignment. Rearend sidesway correction is done in the same way.

A sidesway correction for a unitized vehicle also is done in the same way, with one exception: The body or wheelhouse panels must also be corrected at the same time. The large hook, body frame clamp or pull plates, furnished with the portable aligning equipment, are used for attaching to the vehicle either singly or in combination. On some cars it may be necessary to reverse the means of attachment. Sidesway of the body is correct when "X-ing" measurements made at the wheelhouse panels are equal.

Twist—Removing twist is the final type of frame misalignment correction. For this the operator removes the aligner from under the vehicle and installs a twist beam on top of the main beam, as shown in one of the illustrations. By means of a locking stud and handle projecting through the main beam the twist beam is snugged into place. One of the hy-

Mash and sag correction hook-up on a unitized body. Two stretch and pull hook-ups are used—one high on the wheel house panel, the other attached to frame.



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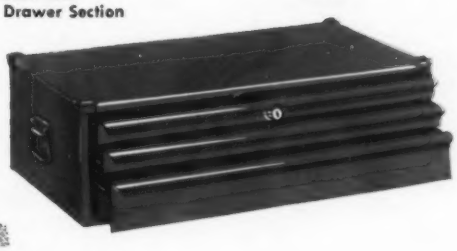

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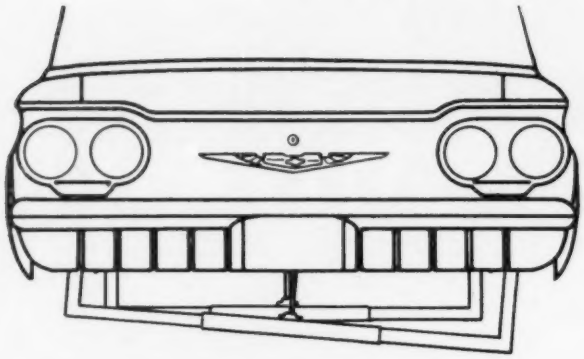


A centering gauge at the cowl area and rear door area will check for frame twist.

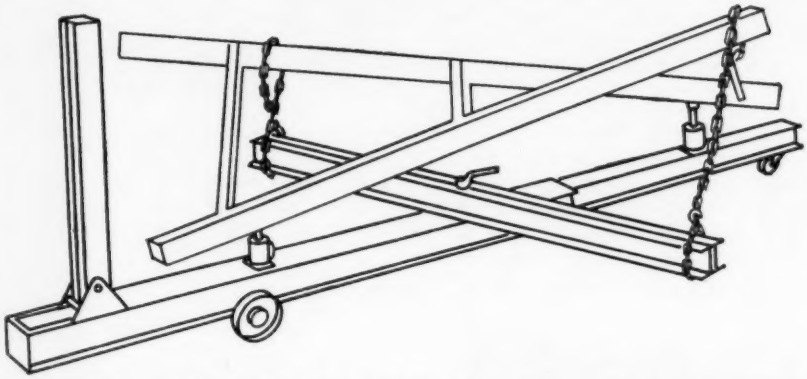
gauges and measurements before assembling suspension parts, wheels, metal-work and bumpers. And, in conclusion, the operator must check front wheel alignment before considering the work complete.

Binding Door Handle

To eliminate binding of the front door outside handle on 1961 Dodge Polaris and Dart models, add a plain washer (3/16″ I.D., 7/16″ O.D.) on the studs of the door outside handle, prior to assembly to the front door panel.

draulic-power units is removed from the base of the tower beam. Next, the equipment is rolled diagonally under the frame so that the power unit and handjack can be placed on the main beam at the two low points of the twist. The twist beam is positioned in the opposite diagonal so that chains may be attached to the high points of the twist. The twist beam is then locked securely to the main beam.

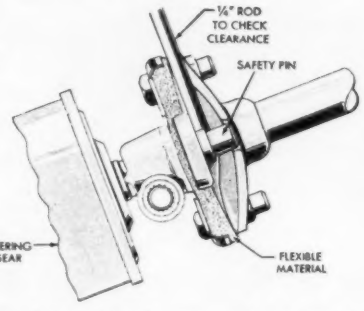
The frame centering gauges are installed and equal pressure is applied to the jacks. Twist is corrected when the two centering gauges are parallel to each other. When the job is done it is advisable to check again with



Hook-up for correcting frame twist, using an I-beam "twist-beam". Equal pressure is applied to the jacks, and job is complete when centering gauges are parallel.

Noisy, Sluggish Steering Caused by Misaligned Steering Gear and Shaft

According to a recent Lincoln-Mercury Service Bulletin, misalignment between the steering gear assembly and the steering shaft can result in a metallic noise or feel. In most cases this noise will be the result of interference between the steering shaft and the steering gear worm shaft.



This condition can be checked by inserting a ¼″ rod into the flexible coupling between the ends of the worm shaft and steering shaft (see illustration). If the ¼″ rod cannot be inserted, insufficient clearance is indicated and the steering shaft and column must be loosened and moved upward, and then retightened.

In a few isolated cases it may also be necessary to add or remove shims between the steering gear assembly and the frame in order to achieve proper alignment between the steering gear and shaft assemblies.

Air Bubble in Gear Box Causes Knocking Noise in Steering Gear

According to a recent Mercury Service Bulletin, a knocking noise in the steering gear may be due to insufficient steering gear lubricant. It is possible that an air bubble can form in the steering gear box and give the false impression that there is an adequate amount of lubricant. In order to assure that the lube level is proper, the factory recommends the following steering gear checking and filling procedure be used:

Turn the steering wheel to full left turn position and remove the filler plug and lower sector cover attaching bolt from the steering gear housing. Agitate the lubricant with a screwdriver through the filler plug hole to dissipate any possible air bubbles.

Check the lube level. It should be even with the edge of the lower sector cover attaching bolt hole. If level is low, add the correct lubricant until it is level with the edge of the lower sector cover attaching bolt hole. The attaching bolt should be left out when filling, providing an air bleed which will reduce any tendency of the lubricant airlocking and giving the false appearance of sufficient grease.

Now cycle the gear through a full right turn and back to the full left turn position; then, recheck the fluid level. Install lower sector cover attaching bolt and filler plug.

Spark Plug Location is Tip-Off to Ford-Chevrolet Engine Displacement

When servicing Ford and Chevrolet spark plugs, you can easily identify V-8 cu.in. types and in turn better interpret spark plug reach or heat range size chart designations by noting the location of the spark plugs with respect to the exhaust manifold.

On all Chevrolet V-8 engines, except the "W" series 340 cu.in. model, the spark plugs are located **under** the exhaust manifold. On "W" series 340 cu.in. models, the plugs are located **above** the manifold.

On current model Fords, only the 292 cu.in. V-8 engine has the spark plugs situated under the exhaust manifold. All other engines have plugs above the manifold.

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By GUY F. WETZEL
Technical Editor

In looking around, "engine rebuilding" signs can be seen quite frequently. However, the term is so often loosely used that it was a pleasure to visit a shop where conscientious mechanics do . . .

Engine rebuilding—the right way

• THE TERM "Engine rebuilding" covers a lot of territory and involves a wide variety of operations and replacements. AUTOMOTIVE SERVICE DIGEST has consistently advocated high quality, precision engine work and therefore it seems logical to point out various factors that influence the performance and service life of rebuilt engines.

When an engine is "rebuilt" it may get anything from new rings and a valve grind to a complete overhaul. The satisfaction and durability of the job are generally about proportional to what is done on the job in connection with the rebuilding work. The facilities available to the shop where the rebuilding is done will govern both the number of operations and parts involved and will have an important effect on the quality of the workmanship since in general, superior work can be done only on the most suitable equipment.

SERVICE PROGRAM IS THOROUGH

As an example of what we consider a high grade engine rebuilding shop on a commercial basis, the writer visited Forberg Automotive in the busy and thriving city of San Jose, Calif., which has a population of something over 200,000.

This shop, while a relatively small establishment, does carry out a program of thorough engine rebuilding with every important operation performed with precision, using excellent equipment, and all essential parts replaced with either parts reconditioned to make them equivalent to new or parts that are actually new. All the parts installed are comparable to new original equipment parts.

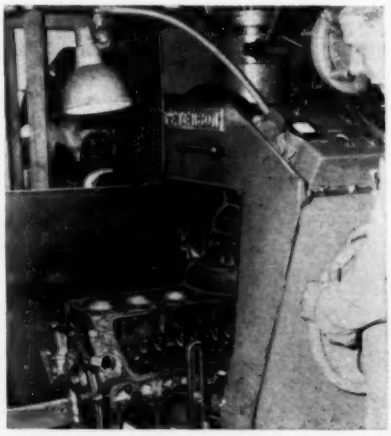
This shop will either rebuild an engine for an owner or another shop (with appropriate price differentials) or will offer rebuilt engines on an exchange basis. In addition, crankshafts are reground, connecting rods and pins are fitted and cylinders are rebored and repaired for shops not equipped to do this work.

START WITH STRIPPED BLOCK

When an engine comes into the shop it is stripped down completely, including removal of the core plugs and the block is dropped into the hot cleaning tank. It is left in the cleaning compound long enough for the accumulated mud, scale, and rust to be suitably cleaned out of the water jacket. This is one of the first places to start a quality overhaul job, since foreign matter in the water jacket may mean hot spots and poor circulation, and result in a hot running engine.

After the cleaning, the block is thoroughly inspected for cracks by means of a Magnaflux magnet and Magnaflux crack-revealing powder. The main bearing bores are inspected for condition and all camshaft bearings are removed. Valve seats are checked and where they are not in condition to provide good seats when ground, valve seat inserts are installed.

Cylinder blocks and head surfaces are quickly and accurately ground on a wet-type surface grinder.



If the main bearing bores are in poor condition the bearing caps have a few thousandths taken off the parting faces and the bores are recut to standard size with the line boring tool. It is possible to raise the center of the bore as much as .003 in. without any appreciable effect on meshing of camshaft drive gears or sprockets and chain. Using the line boring bar gives assurance that the bearing bores are precisely in alignment.

SMALL CRACKS REPAIRED

A surprising number of blocks have cracks around the valve ports. Where this is the case, it is possible to make satisfacory repairs by means of threaded, tapered cast iron pins. These pins have a taper about equivalent to that on pipe threads and are approximately ¼ in. in diameter. A hole is drilled and tapped with a special tap and the screw inserted tightly. Where more than one is required additional pins are used. Being of cast iron the expansion due to heat is the same as the block metal so the screws stay tight. When the block is faced the screws are levelled off and cannot be easily seen.

Cylinders with bad score marks or with holes in the cylinder wall come up every now and then and require sleeving. The cylinder is bored out to allow for the thickness of the sleeve, allowing .001 to .002 in. interference, and the sleeve is driven into the cylinder with a sledge hammer. This method has been found preferable in this shop. Arbor presses are, of course, used in many shops for this operation.

ALL BLOCKS SURFACE GROUND

As a matter of routine every block has its top surface, or surfaces in the case of V-8's, ground on a Peterson grinder. This removes any gasket-worn grooves or pits in addition to giving true, flat surfaces. Since the block is located on the grinder by the bearing bore surfaces the top surface of the block will have to be perfectly parallel to the centerline of the crankshaft. It also provides a clean, flat surface for the cylinder boring bar so that the centerlines of the cylinders will be at perfectly right angles to the crankshaft centerline.

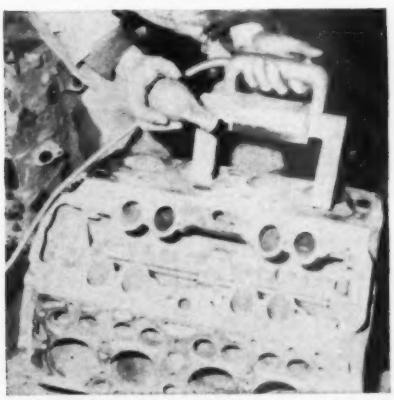
It is absolutely essential that the *correct geometrical relationships* of cylinder centerlines, crankshaft centerlines, piston-pin centerlines and crankpin centerlines be maintained in order to have a free running engine. In other words, the piston pins must be exactly parallel to the crankpins and to the centerline of the crankshaft, and the cylinder centerlines must be perfectly square with the centerline of the crankshaft. The care and precision with which the surfacing and boring are done at Forberg maintains these highly essential relationships.

CRANKSHAFTS RECEIVE THE WORKS

In the crankshaft department, every shaft has both main and crank journals reground to a definite undersize, generally .010 in. under, where the journals will clean up with this much metal removed. After grinding to size the journals are polished on a polishing machine using a coated abrasive belt. Shafts that are to be stored have their journals coated with an anti-rust material.

In cases where one, two or three journals have been battered up by bearing failure or other failure, or thrust surfaces are excessively worn, suitable metal is welded into place on the defective journals, or bronze is brazed into place on the thrust surfaces. Welding by the shielded arc process has been found by this shop to be superior to metalizing or chromium plating. Shafts treated by the welding method have proved to be quite satisfactory in use. Bronze at the thrust surfaces stands up very well.

All blocks are Magnafluxed for cracks.

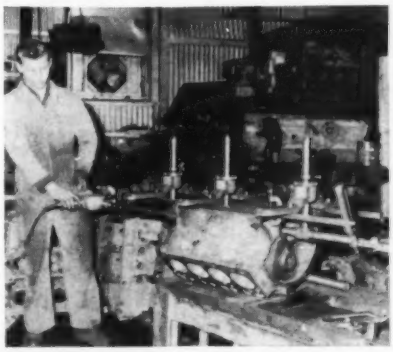


The bearing inserts that are used have added thickness to compensate for the journal undersizes. This extra thickness is in the bearing shell rather than in the bearing alloy, so that the bearing metal thickness is the same as that in the standard size bearings. This contributes to giving the same long bearing life that is anticipated with the standard bearing dimensions, and applies to both main and rod bearings.

NEW CAMSHAFT BEARINGS A MUST

While most camshaft bearings are found to be in reasonably good condition, it is advisable to put in new bearings, and this is always done. New bearings maintain the quality at this point that is standard throughout the engine. In each case a fully reground camshaft is installed; that is, the cams are reground. There is so little wear on the journals that they are not ground undersize, the standard size is maintained.

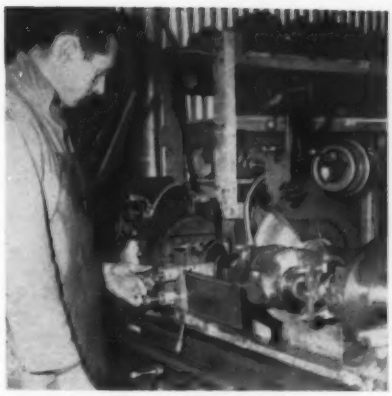
The camshaft on the late model, high-performance engine, is one of the several places where there is liable to be excessive wear. Therefore, a reground shaft, which is equivalent to a new one, is "playing safe" and this *should* be done by all quality engine rebuilders, even when working on a very small scale. In case camshafts that are removed from engines that are brought in are too badly worn to justify trying to regrind them, they are replaced.



Main bearing saddles, and in some cases main bearings, are line bored to assure precision alignment.

HYDRAULIC LIFTERS REPLACED

Hydraulic valve lifters are all replaced in rebuilt engines since lifters that have seen considerable use are liable to have varnish deposits which will interfere with their proper action, or they will be worn or have worn check valves, making them unsuitable for further use without more work on them than is generally justified.



Every crankshaft that goes into the rebuilt engine has both main and crank journals reground to a definite undersize.

Mechanical lifters, on the other hand, can be reconditioned to give further satisfactory service. The surface that gets the most severe wear is on the bottom that contacts the corresponding cam on the camshaft.

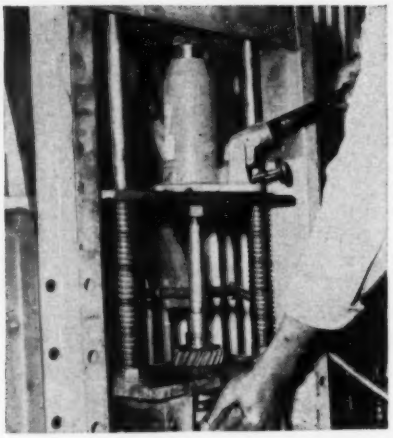
New mechanical valve lifters in new engines have a slightly rounded surface with a rise of .002 to as much as .010 in. from edge to center. All Forberg rebuilt engines are equipped with similarly rounded lifters.

The used lifters are frequently worn somewhat concave and are often pitted. The reground rounded lifters seem to give better action with the cams. Also, with rounded lifters there is uniform contact with the heel of the cam, making it easy to set the desired valve end, or tappet, clearance, since there will be uniform clearance from ramp to ramp on the cam. The rounded surface is obtained on a special grinder using a stone dressed to the correct curvature for the particular lifters being worked on.

On engines which have worn valve stem guides, new ones are installed if the guides are removable. If the guides are integral with the block casting there are several methods that may be used to correct the worn condition. The guides can be bored out and replaceable guides inserted, or the worn holes can be knurled internally. The action that is taken depends on the block design and degree of wear.

GEAR REPLACEMENT S.O.P.

It is standard practice to replace both crankshaft and camshaft gears on all engines so equipped. An ingenious, home-made hydraulic press with appropriate fittings and fixtures is used to press off the gears, which usually are on pretty tight.



Replacing crankshaft and camshaft gears on rebuilt engines is standard practice.

On chain driven camshafts, the sprockets are carefully inspected and replaced where too much wear is evident. New camshaft drive chains are used on every chain drive engine. Care is used when installing the camshaft drive to get the valve timing correct, but another test that is made later will catch any engines of the flat head type that may inadvertently have the valve timing wrong, though cases of this kind are extremely rare.

On flat head or L-head engines, with valves in the block, intake valves, which are in good enough condition to justify it, are ground and used again, but generally new exhaust valves are installed. New valve springs are used throughout. When flat head engines are assembled the valve clearance is set to manufacturer's specifications.

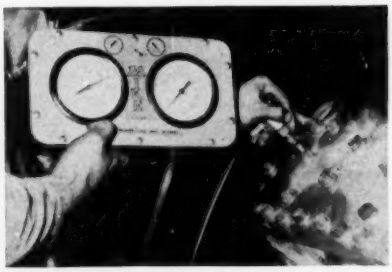
With engines of the overhead valve type, this rebuilder, in common with most rebuilders, supplies short blocks, without the head. The service shops which sell and install the rebuilt engines can more profitably recondition the heads themselves, though heads are often brought in to have them surfaced.

PISTON AND ROD SERVICE

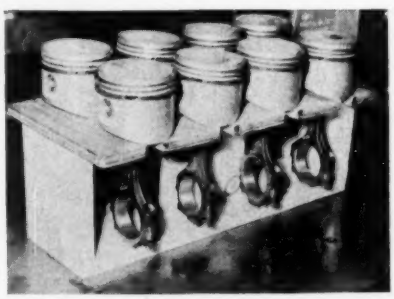
Connecting rods are highly stressed and important parts in an engine, and the way they are treated will have an important effect on the service rendered by the engine. All connecting rods first have .003 to .005 in. removed from the parting face of the bearing cap on a suitable grinder. The cap is then assembled and the connecting rod bearing bore is resized to bring it back to original size. This is done on a Kwick-Way machine using a coated abrasive running in honing lubricant to do the cutting. This operation brings the lower end of the connecting rod back to the correct size and also corrects any stretch there may be in the lower rod end. The roundness tolerance allowed is two tenths of a thousandth (0.0002 in.). A new bushing is installed in the upper end of the connecting rod.

With the lower end held in an expanding arbor, which is firmly held in place on the boring machine, the upper end is accurately bored on a Tobin-Arp pin boring machine. Piston pin holes thus bored are round, straight and true, and are held to a size which will give two tenths (.0002 in.) clearance for the piston pin. This means a free fit for the pins in the connecting rod bushings which have a 100% bearing surface, and with correct lubrication will maintain a precision fit for many thousands of miles.

Holding the rod firmly on the boring machine by means of an arbor, which is locked in a position parallel to the pin boring bar, insures that the centerline of the piston pin hole is parallel to the lower rod bearing bore, and will maintain the desired geometry between crankpin and piston. Furthermore, since the two holes are parallel, no rod aligning is necessary.



Compression pressure and vacuum are checked on all flat head engines to verify tightness of valves and correct valve timing.



Rack used for holding a set of piston and rod assemblies for an engine which keeps them clean and ready for installation.

Inasmuch as only new pistons, which come with pins fitted, are used, all rods are bored for standard size piston pins. In some cases customers bring in sets of pistons and rods for boring and aligning, which is done on request, as the needed alignment fixture and straigtening press are on hand.

After pistons and rods have been assembled, rings are put in place in the piston ring grooves, with ring gaps carefully turned so they are opposite from each other. The assembled pistons and rods are inserted in the respective cylinders and the connecting rod nuts are tightened to specifications with a torque wrench.

ENGINES GIVEN TEST RUN

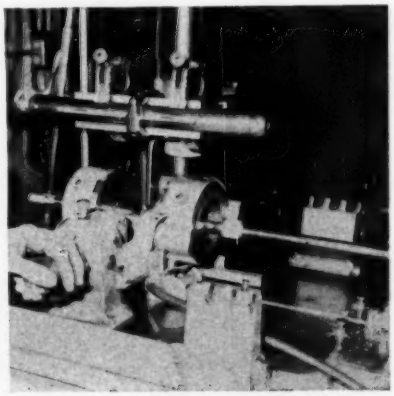
The flat head engines have the heads put on and all head bolts are torqued to the specified tension, in the recommended tightening sequence. After this, each engine is mounted on a stand and motor driven for twenty minutes. After the engine has run long enough to have the oil well circulated through the passages and parts, both the compression pressure and vacuum are checked. This gives a good check on the valve tightness as well as valve timing. On any units that have below normal vacuum or compression pressure, all factors affecting these items are checked to find out why, and the cause corrected. Thus no flat head engine can get out of the shop in defective condition.

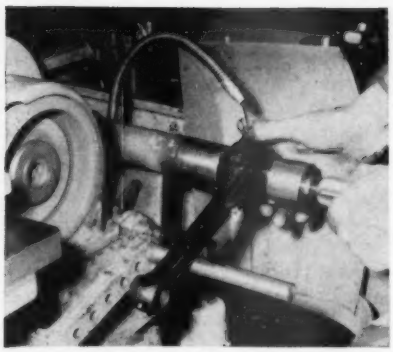
The OHV engines, which usually go out with short blocks, receive the same run-in treatment, but without heads the vacuum and compression pressure cannot be taken However, all oil passages are well filled and the cylinders and rings are well lubricated.

All cylinders, after being bored, are carefully honed so that a criss-cross pattern is formed on the cylinder walls. This expedites the seating of the rings. Normal careful operation of the rebuilt engine when first put into service will cause the rings to seat within the usual thousand miles or less, so that complaints of excessive oil consumption are quite rare.

As is evident from the foregoing, the procedures followed in the Forberg shop represent excellent rebuilding practice. There are numerous operations that could be omitted and are

All piston pin bushings are bored to a tolerance of .0002 in.





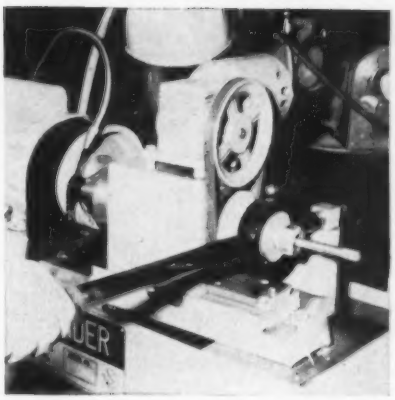
Crankpin bearing bores are wet honed to give a roundness tolerance of .0002 in.

omitted in many shops, but doing them adds to the quality and dependability of the engine job, and it is felt that it is well worth the extra effort and expense here. They are not trying to extract the last penny of profit from each engine worked on, but rather, are endeavoring to build a reputation for quality workmanship and fair dealing. Judging from the nice accounts they have and the repeat business, this objective is accomplished.

Frank Berger, the owner and operator of the shop was commenting on some of the things that come up in this business. In one case, a shop which installed one of his engines called up with the complaint that the engine had overheated, burned out bearings, and the pistons had seized, and they wanted to know what he was going to do about it. Since Berger stands back of his work, he told the man to have the engine brought in and he would see what caused the trouble and do what ever should be done to rectify the situation.

The engine was removed and taken down. It was found that the shaft which drives the oil pump had broken off, resulting in oil pressure failure, and this was the cause of the trouble, not the fault of the engine work that had been done.

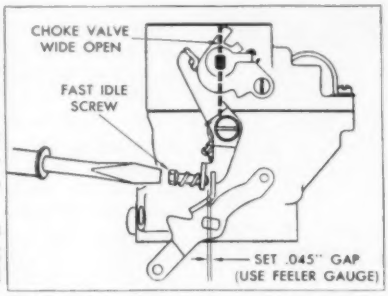
This, of course, explained the engine failure and proved that the engine rebuilder was not responsible. So, the complaint was dropped. Other complaints have come up occasionally, though over half of them are unjustified.



Mechanical valve lifters are faced on the lower surface with a slightly curved surface so that the lift from center to edge is from .002 in. to as much as .010 in.

Corvair Fast Idle Setting

The fast idle screw on early 1961 Corvair and Corvair "95" carburetors was set at .010"-.020" for Powerglide and .030"-.040" for Synchromesh transmissions. These settings, however, result in an excessively high fast idle speed, when the carburetors are operating on half to full choke.



To reduce this high rpm during cold warm up, all Corvair and Corvair "95" productions carburetors are now adjusted with the fast idle speed screw gapped .045" from the tang on the throttle lever.

The factory recommends the following procedure for adjusting fast idle on 1961 carburetors:

- With engine warmed up, set normal curb idle speed.
- Hold choke valve wide-open while adjusting fast idle screw to obtain .045" clearance between end of screw and tang on throttle lever. Use feeler gauge for checking clearance.

Poor Engine Performance Traced to Punctured Spark Plug Cables

Dealer reports of engine miss and poor engine performance due to faulty spark plug cables was recently investigated by the Chrysler Engineering Department, and it was found that the spark plug cable insulation was punctured or damaged by the use of engine test equipment. A spark plug cable whose insulation has been punctured cannot be expected to function properly.

Chrysler therefore recommends that the use of the type of test equipment that punctures or injures the insulation of any electrical cables, spark plug covers or distributor cap nipples, be discontinued. It is requested that the practice of puncturing insulation of spark plug cables, covers, or nipples for timing light purposes and for grounding the spark plug to determine the cause of the engine miss be discontinued and the proper method of grounding the plug circuits be used. Some of the reliable test equipment manufacturers furnish spark plug cable adapters for timing light connection and for use in grounding the plug to determine cause of engine miss.

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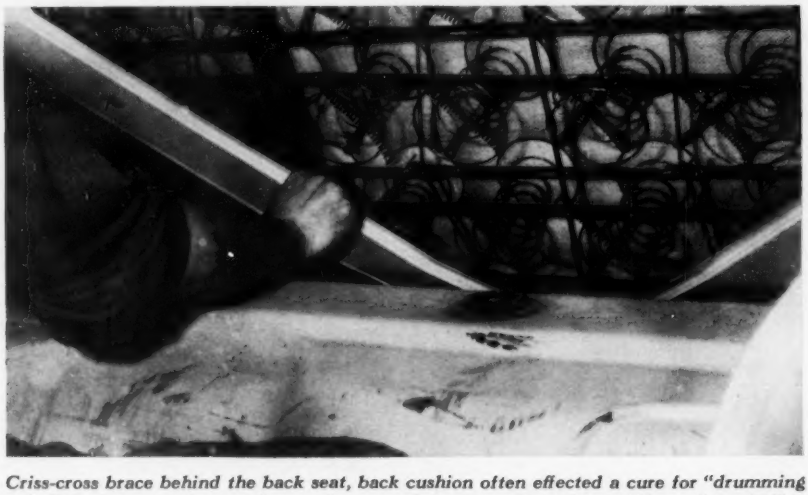
Old problems in a new guise

By E. S. HARRIS

• THE HUMBLE BEGINNING of the medical profession was no more hairy than the launching of the metal-working and painting trades in the automotive service industry. Many thousands of automobiles were jouncing over the highways long before even a small percentage of them was backed up by any metal repair or paint replacement facilities of any kind, whatsoever.

The ailing human patient of a century and a half ago who had to depend on the village barber to bleed him or set a broken bone had the questionable service far more conveniently located than the automobile of 30-odd years ago which crumpled a fender or suffered a weathered paint job.



Criss-cross brace behind the back seat, back cushion often effected a cure for "drumming noise" in by-gone days and may have a place for certain jobs with modern bodies.

FAR AND FEW BETWEEN

Fortunate indeed were those within a day's driving distance of a carriage shop where management had seen the handwriting on the wall, and was inclined to admit a few automotive jobs in the shop previously dedicated to repairing wagons, shays, buckboards and carriages. Of course these artisans were not inclined to promise one-day, one-week or even one-month delivery on a brush-applied and hand-rubbed paint job. And even when the agreed estimated six-weeks possession for the job was settled, they'd carefully scan and palm the metal surfaces to make sure no waviness or bumps were evident to mar the perfection of their projected re-paint job.

If some hapless driver had previously dented a fender and his mechanic had done his best to bump it back into shape—too bad! No paint job could be attempted until that fender was replaced with a new one which would offer a decent basic surface for painting.

TODAY'S BODY MAN WOULD FLIP

Modern metal workers who have had frustrating experiences trying to work imported sheet metal with different characteristics than domestic stock, would really have flipped if faced with a ding job on some of those old crates. Nothing short of a 12 lb. sledge with an 80 lb. blacksmith's anvil for a dolly could begin to work the heavy-gauge metal they employed. Mechanics usually pounded the bent fenders into some semblance of the original shape, then used a little black touch-up paint to discourage rust until a new fender could be ordered from the factory.

When sheet metal repairmen and painters—or the combination of both trades—began to move into the service scene, few could believe the miracles they could do with a handful of tools and a spray gun. When they tossed in a lead-wiping job that would do credit to a master plumber, sharp indeed was the eye that could detect a repair job—even in difficult moulding areas.

Those times would definitely come under the heading of "the good old days," for customers have become so accustomed to body shop miracles that they often demand super-miracles and want them executed in jig time. "I wrecked it in 2 seconds, so why do you need 2 weeks to straighten it out," seems to be the general attitude.

The body department has built a good backlog of experience down through the years, so it is often able to create repairs and realign components that would appear hopeless to even the good-old-days' magicians. The repairs to the welded portions of some of the unitized bodies must not only be pleasing to the eye, but provide strength and support for the whole vehicle.

Occasionally some of the old problems of the '30s may pop up in a new guise and cause a completely different result. For instance, the veteran body mechanic who recalled a problem in the past when trunk lid latches were destroyed on some models of sedans and rear deck lids on others danced a jig with a drumming noise calculated to drive the motorist nutty. He was able to boil down these symptoms to the need of a crisscross brace behind the back seat, back cushion which the manufacturer had failed to install on some bodies. On others, which did provide the brace, the trouble occurred when the brace broke away from its anchors and the body could shake laterally.

Installing a shop-made brace, or reinforcing the anchors on the existing brace was all the "fix" required to cure the trouble on these bodies back in the mid '30s, and the job was stored in the shopman's memory.

Have You Used Equipment For Sale? Use Our Classified Columns . . . Page 80

Recently he caught a rash of unexplained back glass breakage which jogged his memory. He tried an experiment based on this memory, and sure enough, the bug had reappeared. By simply reinforcing the cross bracing at the back seat of the modern bodies involved, the back glass was thereby supported and no more breakage occurred.

Body shop problems are many and varied; they may have roots in the past or they may be as new as the paint on the current model. This is the reason many paint and metal men have chosen and follow this ever-changing trade.

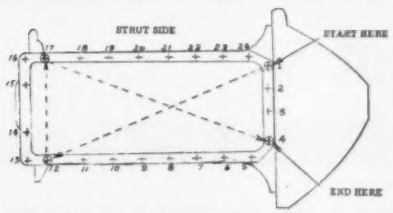
Hot Starting Tip

Hard starting of hot engines generally is caused by excessive fuel vapors present in the intake manifold, a result of percolating, spill-over from the carburetor fuel bowl, as well as other mechanical or electrical conditions. This means a deficiency of oxygen in the intake manifold.

Advise car owners encountering this trouble to open the throttle wide to bring in oxygen and "flush" the manifold—but be sure and remind them not to pump the throttle. This merely dumps more fuel into the manifold and worsens the condition.

Proper Torquing Sequence Cuts Pan Gasket Leakage

To minimize the possibility of oil pan gasket leakage on the Plymouth



225 cu.in. or the Valiant engine, it is important when installing an oil pan, that the retaining cap screws be tightened to 200 in. lbs. torque in the sequence shown here.

Tighten numbers 1, 12, 17 and 4 in this sequence, then either pan rail, followed by the rear (2) and front (4) cap screws.

Use Gauge to Adjust Drive Belt Tension

When installing new drive belts on 1961 Lincoln Continentals, the factory recommends the revised belt tension specifications indicated below be used for belt adjustment. These increased initial and reset belt tensions will eliminate belt squeal induced by initial stretching of new belts. The reset belt adjustment specification should be used whenever the new belt has been run for more than ten minutes.

Drive Belt Usage	*Initial Tension*	*Reset Tension*
Generator and Water Pump Belt	100-120 lbs.	90-100 lbs.
Air Conditioning Compressor Belt	100-150 lbs.	80-120 lbs.

Correct belt tension lies within a narrow range of adjustment. Insufficient tension results in belt squeal; over-tightening drive belts causes premature wear of water pump, generator, and air conditioning compressor bearings.

Thumb pressure method should not be used to adjust belt tension. According to Lincoln service engineers, correct drive belt adjustment is assured only when a belt tension gauge is used.

Use Correct Cap Screws on Rambler Main Bearings

American Motors advises that there are two different lengths of main bearing cap screws used in the 6-cylinder cast-iron engines. Cap screws 2-7/18″ long are used to secure the front and rear main bearing caps; cap screws 2-13/16″ long are used in both intermediate bearing caps.

If these cap screws are not used in their proper location, the cap screws will bottom in their threaded bore in either the front or rear bearing location, thus resulting in excessive oil clearance.

When inspecting or replacing main bearings, the factory recommends checking the cap screw lengths to make certain that they are of the proper length and used in their correct location.

Ignition Timing on 1959-60 V-8 Larks

If you're getting complaints of detonation and pinging on 1959-60 V-8 Larks, they may be due to excessive spark advance. You can correct this situation by resetting the timing, using the following procedure:

1. Disconnect the distributor modifier vacuum tube at the carburetor and install a temporary plug in the port.

2. Attach a power timing light.

3. Using a tachometer, set the engine idle at 600 rpm and at this idling speed set the ignition timing to the correct mark on the vibration damper.

4. Remove the temporary plug from the carburetor and reconnect the vacuum tube and readjust engine idle speed to 550 rpm. *Courtesy, Standard Motor Products, Inc.*

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Controlling manifold heat

When checking out poor engine performance complaints, don't overlook the manifold heat control valve. Although simple in design and rugged in construction this vital unit does require service from time to time so as to assure its being able to do the important job cut out for it.

By E. S. HARRIS

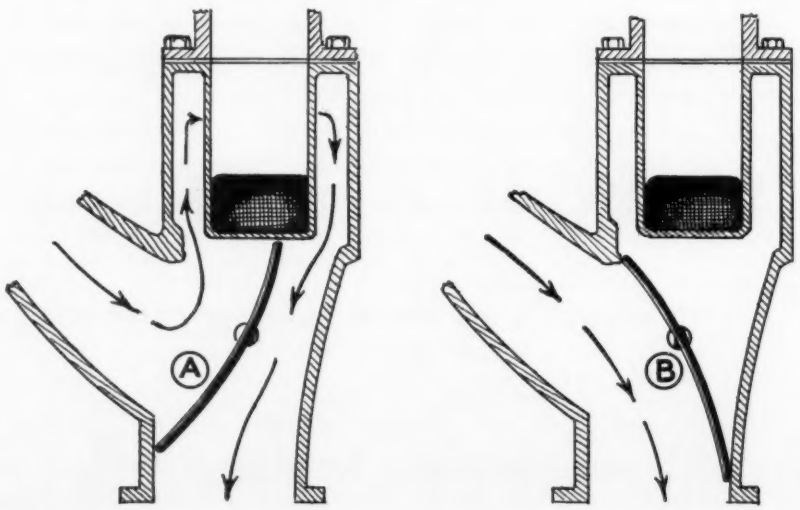
• PROBABLY NO ENGINE unit has come in for more design activity than intake and exhaust manifolding. Since it has little sales appeal, however, and since little service is necessary in maintaining the manifolds, little mention is given the subject. Veteran mechanics may well remember how the carburetor has been moved from place to place in relation to the intake and exhaust manifolds down through the years before "updraft" carburetors were replaced by "downdraft" carburetors, and how all types of intake and exhaust manifold combinations and locations were tried.

"COLD BLOODED" ENGINES

On some of the earlier engines the carburetor was suspended so low on a long intake manifold that it allegedly got in the way of the mechanic working under the car taking up rod bearings. It was in these times you heard a lot about "cold blooded" engines, and often saw accessory priming devices and manifold warming devices advertised as useful items for the motorist to install.

All this was just a part of the manifold designers problem of feeding an engine a uniformly vaporized mixture of fuel and air in varying ratios and quantities through wide operating ranges. For the fuel supply he had a liquid fuel delivered by gravity to a point only inches from the feeding point, and the great outdoors was then, as now, the air supply and pressure agent.

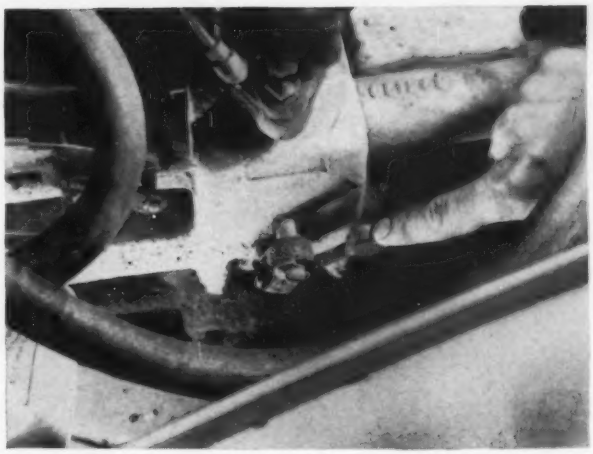
Of course, this fuel was slightly temperamental in its behavior and was inclined to vaporize nicely at certain temperatures, remain in a liquid state when cold, and expand too much if the temperature was too high. It was the engine designer's attempt to keep the cylinders of the cold-starting engine from loading up with liquid fuel, that dictated the low-slung, updraft carburetor—the mixture almost had to be in a vaporized state to travel up the long stack to the firing chamber with this arrangement. But the cylinder stoking advantages of downdraft carburetion became apparent and soon displaced the updraft carburetors even though they had been moved upward considerably and were functioning



When closed, as at position A, the heat control acts as a gate valve and shunts the hot exhaust gas around the intake manifold. As the engine temperature rises, the heat control valve opens as at B, and permits exhaust gas to be discharged directly.

more favorably due to their proximity to the warm engine block or exhaust manifold.

Downdraft carburetors on in-line engines drew the necessary cold-weather operation warmth from the exhaust manifold; in fact a butterfly valve installed in the exhaust manifold deflected a little more exhaust heat upward to the intake manifold in winter than in summer. This valve was operated manually, and the driver or his mechanic was supposed to move it towards the Summer location as the weather warmed, and back towards the Winter position when the weather was cold. But this little moving operation was often forgotten, and engine performance suffered accordingly. It was then that the idea for an automatic thermostatically controlled manifold heat control valve was born.



Operate the heat control valve through its full travel to check for any evidence that the shaft is binding or sticking.

Due to the high temperature location of heat control valves, engine oil is not recommended for lubrication. Special heat control valve solvents should be used—every 1,000 miles or so.

HEAT SOAK-BACK

One of the most critical heat problems in the fuel system is "heat soak-back" after a steady run, and the intertwined intake and exhaust manifold arrangement resulted in some rather fantastic temperatures. With the engine shut down after a 60 mph level road operation at an ambient air temperature of an uncomfortable 100° F., the intake manifolds on some cars were found to reach a temperature of over 325°, while the average temperature of others would reach a hefty 250° to 275°. It was evident that with manifold temperatures like this, a manually operated manifold heat control valve directing more heat upward to the already overheated intake manifold and carburetor would prevent the engine from starting, or, if it would start, it would operate roughly. So the positioning of the heat control valve was taken out of the hands of the driver or mechanic and was made to operate automatically by a thermostatic type spring, usually assisted by a counterweight.

LOCATION AND CONSTRUCTION VARIES

The manifold heat control valve varies some in location and construction in various makes and models of engines. Generally it is constructed of a special heat-resisting, stainless steel butterfly valve, shaft, and shaft bushings to resist exhaust heat and acids and to preclude sticking. It by-passes the hot exhaust to the intake manifold when the engine is cold and the thermostat coil spring, attached to the valve shaft and anchored to the manifold, is relaxed. As the exhaust manifold warms up, the thermostat spring tightens up and slowly opens the valve, assisted by the exhaust flow. The exhaust gases are then diverted away from the intake manifold so as to pass directly into the exhaust line. On most of the modern heat control valves there is a counterweight attached to either the same end of the shaft as the spring, or to the opposite end of the shaft. The counterweight holds valve open when engine is hot and operating at low speed.

On V-8 engines the heat control valve usually directs the exhaust gas from one cylinder bank through the intake manifold heater body and into the exhaust line of the opposite bank, during the warm-up period. The exhaust gas will then return to flow through its own exhaust line after warm-up, as the control spring tightens up and moves the valve in the manifold.

Due to the remote location of the intake manifold in regard to the exhaust manifold on V-8 engines, the "soak-back" intake manifold temperatures are considerably lower (100° average) than those mentioned before. The heat received from the engine block during operation is adequate for normal operation after the manifold control valve has diverted the exhaust heat away from the intake manifold and back into its own direct outlet.

CARBON OR CORROSION MAIN ENEMY

Manifold heat control valves are simple in operation and rugged in construction, so there is seldom little trouble with them in normal use, unless carbon

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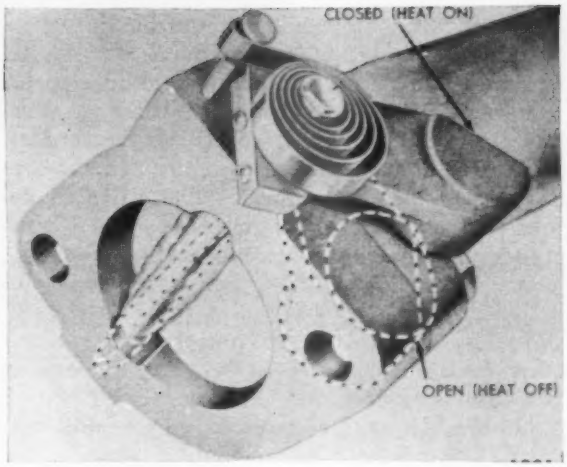


Typical exhaust gas control valve as used on a V-8 engine. A check should always be made to make sure that the thermostat spring is hooked on its stop pin.

or corrosion causes sticking of the valve shaft in its bushings. In order to make certain the valve moves freely through its full travel the mechanic is advised to check the action during each tune-up or when tracing hard starting, slow warm up or poor performance complaints. Stuck control valves can usually be loosened by lightly tapping the shaft ends while exerting finger pressure on the counterweight. Applying powdered graphite mixed in alcohol and kerosene helps free and lubricate the shaft in its bushings. Lubricating oil is **not recommended** as it may form gum or carbon on the shaft due to the manifold heat.

Because of its location in the exhaust stream and gradual operation, the valve may cause a light metallic chatter at certain points of its operation, usually when the cold engine is warming up. Some manufacturers have installed stop springs which cushions the rattle if properly adjusted. Occasionally someone gets the bright idea of taking another wrap or so with the thermostatic spring, and this, of course, upsets the carefully calibrated action of the valve, and the spring will require replacing if this changed its contour.

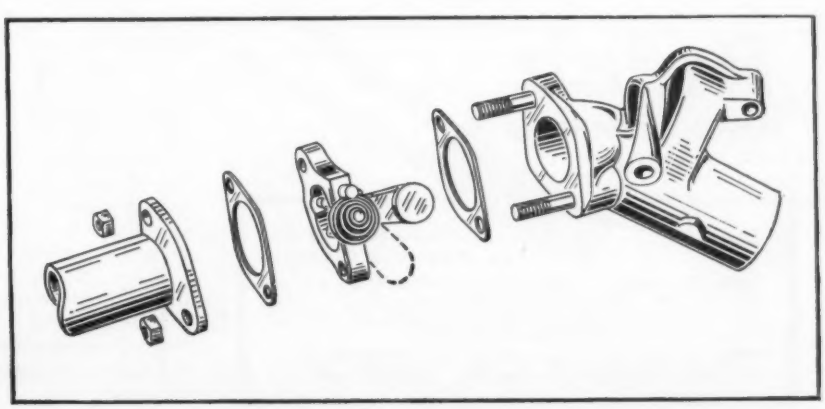
The manual check of a heat control valve merely involves turning the counterweight by hand to see if it is securely mounted on its shaft and that the latter turns freely in the manifold. A visual check can be made by accelerating the engine several times to see if the counterweight "flutters." If it does, chances are the valve is operating as it should. If not, the valve plate may be burned to the extent that it is offering no resistance to the exhaust gases. Obviously, it means replacement of the assembly.

While the counterweight of a heat control valve does not look too impressive, it nevertheless plays a very important part in the exhaust stream. Without the weight the valve could not work. Generally speaking the heat control valve is a velocity-type valve, that is, the plate is mounted off center on the shaft. Thus, the velocity of the exhaust gases tend to open the valve. The weight exerts a force in the opposite direction thereby tending to keep the valve closed. If the weight is loose, broken or missing, the valve naturally will open much too soon through the action of the fast moving exhaust gas.

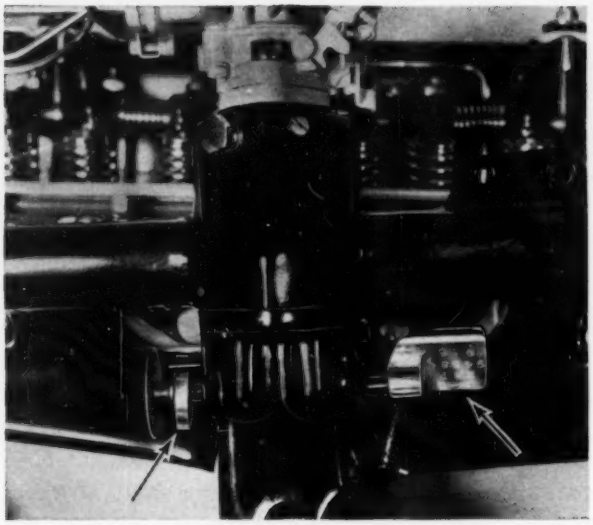
HELPS PREVENT CARBURETOR ICING

At comparatively low engine speed the counterweight also tends to partially close the valve, true even after the engine is warmed to normal operating temperature. This action is helpful in preventing ice formation on the edges of the carburetor throttle plates. Cases of carburetor icing have been traced directly to malfunctioning heat control valves.

A greater number of various performance complaints have been laid at the door of the manifold heat control valve, many of which could have little to do with its operation. However, if the complaint is such that it might indicate improper manifold temperature at any given operating temperature, then the mechanic should first make an inspection of the valve conponents and their operation, and then look into the causes, such as a clogged manifold, leaky gaskets, and other possibilities of malfunctioning.



Exploded view of the parts which make up the heat control valve on the 1961 Series 20 and 80 Rambler engines.



On some engine installations the thermostatic spring of the heat control valve is mounted on one end of the shaft, while the counterweight (which holds the valve in a closed position) is mounted on the opposite end of the shaft.

Ford Motor Co., in its shop manual gives the following information about its heat riser valves.

The exhaust gas control valve should be periodically checked to make sure it is operating properly. A valve that is stuck in the open position will result in poor engine performance during initial warm-up because insufficient heat will pass through the heat riser for proper fuel vaporization. If the valve is stuck in the closed position, the intake manifold will be supplied with excessive heat after the initial warm-up period. This will cause poor acceleration, a lack of power, and will cause poor high speed performance in general.

Check the thermostatic spring of the valve to make sure it is hooked on the stop pin. The spring is at the top of the valve housing when the valve is properly installed.

To check the exhaust gas control valve on the car, make sure the spring holds the valve closed when the engine is cold. Actuate the counterweight by hand to make sure it moves freely through approximately 90° of rotation without binding.

The valve is closed when the engine is at normal operating temperature and running at idle speed. However, a correctly operating valve will open when very light finger pressure is applied to the counterweight. Rapidly accelerate the engine to make sure the valve momentarily opens. The valve is designed to open when the engine is at normal operating temperature and is operated at high rpm.

Free a stuck valve with a penetrating oil and graphite mixture.

Normally, the exhaust gas control valve does not require replacement unless it becomes inoperative due to excessive corrosion or damage.

1. On the V-8 engine manifold, remove the control valve from the muffler inlet pipe.
2. Clean the inlet pipe and manifold flanges.
3. Place a new gasket on both sides of the control valve and position it over the muffler inlet pipe studs of the exhaust manifold. Temporarily tie the valve to the exhaust manifold. Install the exhaust manifold.

The exhaust gas control valve on the Mileage Maker Six engine is integral with the exhaust manifold.

In the case of current Rambler car exhaust systems a cast iron alloy exhaust manifold is attached on the outboard side of each bank. The thermostatically controlled heat valve attached to the outlet side of the right manifold directs hot exhaust gases through the heat riser for better fuel mixture vaporization during the engine warm-up period. The standard equipment single exhaust system utilizes a crossover exhaust pipe from the right side exhaust manifold to a "T" connection in the left side exhaust pipe. On the optional equipped dual exhaust cars the right side exhaust system is partially restricted to exhaust flow during the warm-up period, due to the position of the themostatically controlled heat valve.

Don't Overlook Breather Cap It Has Important Function

Most mechanics know that periodic air cleaner maintenance is extremely important to long engine life. Many, however, frequently overlook the maintenance of another less conspicuous filter which also is important to engine operation—the oil filler breather cap filter.

Primary purpose of ventilating the crankcase is to eliminate the various water and gasoline vapors and other blowby products that accumulate in the crankcase, and prevent the formation of crankcase sludge.

When operating properly, the crankcase breather system does this by drawing clean air into the crankcase through the breather cap and circulating it through the crankcase to remove these various waste vapors. The air then is exhausted through a suitable vent pipe or orifice.

If the filter becomes clogged to the point that air flow through crankcase is restricted, pressure in the crankcase is raised beyond normal and may not only result in excessive oil consumption, but also may result in oil leaks at the gasket surfaces of the oil pan and block, or leaks at the seals.

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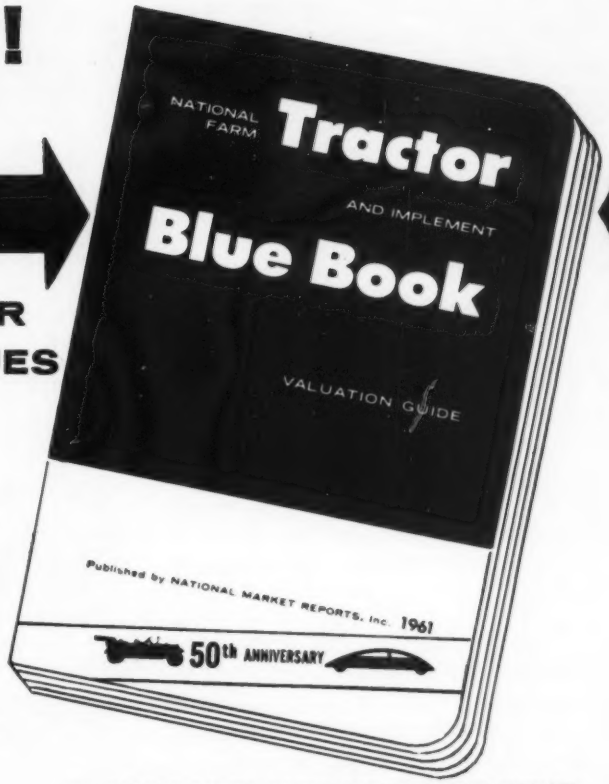

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Alternators . . . (Continued from page 18)

stator are connected end to end to form one continuous circuit, the term "single-phase" applies.

The Chrysler alternator has three sets of windings in the stator. One end from each winding is connected to a common junction. This is called a "Y" connection and the Chrysler alternator is referred to as a 3-phase "Y" connected stator. The output of the alternator is taken off the other end of each of the three windings.

PHASE OUTPUT OVERLAP

Three of the reversing pulse waves can be used to illustrate the output of a 3-phase alternator. The output of each phase overlaps but does not coincide with the other two. The overlapping of the three phases smooths out the total flow of current from the stator windings. However, half of the total output is still in one direction and the other half is in the opposite direction. As was seen in the preceding discussion, alternating current cannot be used for the D.C. system of the car.

It is necessary to change the alternating current flowing from the stator windings of the alternator to direct current by a process called **electrical rectification** by means of a **diode** or **rectifier.** This diode is an electrical device that will allow current to flow in ONLY one direction. (In circuit or wiring diagrams, such as the accompanying full wave rectification diagram, the diode is commonly represented by the arrow-head symbol which shows that current can flow through the diode only in the direction indicated by the arrow.)

When three negative diodes and three positive diodes are connected to the stator as shown, the current output from the alternator to the battery will be in only one direction (direct current). Two of the several possible conditions for current output have been shown in one of the illustrations. From this illustration it is seen that regardless of which direction current is passing from one phase of the stator, current will always enter the positive terminal of the battery and return to the stator via the negative terminal of the battery. The output of the other stator phases is converted to direct current in an identical manner resulting in full wave rectification (entire output is converted to direct current).

STRUCTURAL DIFFERENCES

Having reviewed the operation of both types of generators (A.C. and D.C.), look at a few of their more important structural differences.

Brushes are also used in the alternator, but their expected life is two to three times that of the D.C. generator. This is true because the alternator brushes are only required to handle the field current of 3 amperes while the D.C. generator brushes carry the full output current of 35 to 40 amperes. Further, the alternator brushes ride on smooth-surfaced slip ring conductors instead of a serrated commutator surface.

The drive ratio for the alternator is not a compromise as was seen to be the case with the D.C. generator. A comparison of the performance of the D.C. generator with that of the alternator shows that, with the alternator, there is a substantial output at low speed. Furthermore, the drive ratio necessary for this output is such that neither rotational speed nor wear is excessive for high vehicle speeds.

The alternator rotor contains the magnetic field producing components. It consists of a core pressed on the shaft around which the doughnut shaped field coil is assembled. On both sides of the coil and core assembly are the rugged pole pieces of 5/16 to 1/2 in. steel plates which are pressed on the rotor shaft. Each pole piece has six fingers which nest between the six on the other pole yielding a total of twelve poles. All of the fingers on one pole piece are north pole magnets and those on the opposite side are south pole magnets. The slip rings which are connected to the field winding of the rotor feature a unique design in that one slip ring is cylindrical and the other is radial to help reduce the over-all length and weight of the alternator. Current which flows to the two brushes is supplied to the rotor via the slip rings.

COOLING FANS DO DOUBLE DUTY

The two cooling fans found on the rotor pull air in the front and back of the alternator and expel it outward over the stator windings. The rear fan also draws air over the silicon diodes which must be kept cool. In addition to their cooling function, the fans also serve as part of the rotor magnetic circuit. A ball bearing supports the pulley end of the shaft, and a needle bearing is used at the opposite end. Both bearings are lubricated for life and require no periodic attention.

The next basic part of the alternator is the stator. It is made of laminated steel which has 36 slots and three distinct windings (each one called a phase) which are spaced one slot apart. The three-phase design was selected since it enabled Chrysler Corp. to build a smaller and more efficient machine. The "Y" connection for the phases gives some advantage in that there are two phases contributing to the output voltage. This arrangement gives current output at a lower rotational speed than if only one phase were contributing to the output. The windings of the stator were designed so as to produce a current limiting effect at higher rotational speeds of the alternator.

The end housings of the Chrysler alternator are die-cast aluminum for several important reasons. First, it gives a weight reduction. Second, aluminum

(Continued on page 46)

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Alternators . . . CONTINUED

acts as a non-magnetic insulator to keep the alternator operating at a high efficiency through greater concentration of the magnetic field within its working path. Another feature for the aluminum end housings is the heat transfer properties which are used to help cool the six silicon diodes found in the rear housings. The diodes are pressed into the casting to: provide a good electrical connection; yield excellent heat transfer; and maintain a permanent tight fit. The entire assembly is held together by three bolts which can be removed from the front.

It should also be noted that a capacitor is connected across the charging circuit from the alternator output terminal to ground. It is used to absorb voltage surges induced in the stator windings when the direction of current flow reverses. On some models, the capacitor is mounted internally and on others it is mounted externally. Regardless of the location, however, the capacitor performs an important function and must not be removed from circuit.

SILICON DIODES

The silicon diodes used to rectify the output of the alternator are a very important part of the A.C. system. In fact, the A.C. system was not economically practical for general automotive use until the recent development of this reliable inexpensive rectifier.

The actual diode (or rectifier) consists of a crystal of silicon in a copper case or "heat sink." The crystal itself is a semiconductor material (good conductor of current in one direction) and in this respect is similar to the transistors used in the modern transistor radios. More exactly, however, it has a high electrical resistance in one direction and a low resistance in the opposite direction. The silicon diode used in the Chrysler system will carry 20 amperes in the forward direction at no more than 1.5 volts drop and will block 15 volts with not more than 1 milliampere (one one-thousandth of an ampere) leakage in the back direction.

This silicon crystal is approximately 1/8 in. in diameter and from 0.005 to 0.008 in. thick. It can be operated up to a temperature of about 390°F., but in general can be used at any current which will not raise the temperature of the silicon crystal above this temperature. Therefore, the amount of heat transfer (due to cooling air, outside air temperature, etc.) determines the current rating for a particular size of crystal.

The regulator for the alternator is very compact and requires only one relay (or unit) known as the voltage regulator unit. The regulator for the D.C.

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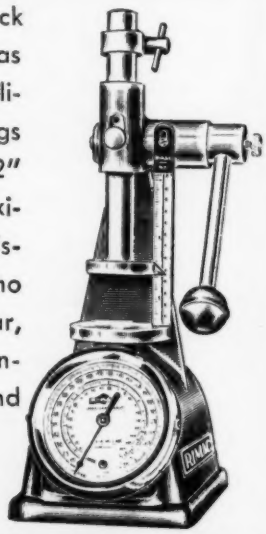

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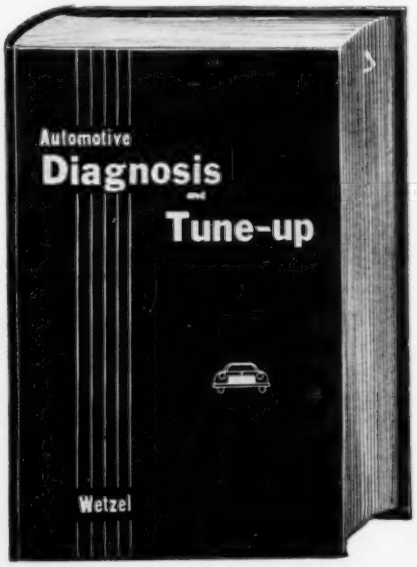

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generator, on the other hand, requires three units—a voltage regulator, a circuit breaker, and a current regulator. A quick look at each of their functions will reveal why this is true.

When the generator (either A.C. or D.C.) is producing current, the output is used to charge the battery and operate electrical loads. For low engine speed (such as idle), however, the D.C. generator is not producing and some means of control is required to keep the battery from discharging through the generator. This is where the **circuit breaker** or reverse-current cutout unit performs the function of completing the battery-generator circuit when the D.C. generator is producing current, but opens the circuit when there is no output to prevent current from flowing out of the battery into the generator. For the alternator, this unit is not required since the diodes prevent reverse current flow.

REGULATING OUTPUT

As the generator (again either A.C. or D.C.) rotates faster and faster, the current output becomes greater and greater. Therefore, in order to prevent the generator from overworking and overheating, some means of regulation is required to keep the output at a safe level. For the D.C. generator, a **current regulator** relay unit limits its field current, and thus output, so as to produce a sharp break in its performance curve. The alternator, on the other hand, is so designed that it yields a smooth performance curve which levels off at a safe limit and requires no current regulation. This self-limiting feature is due to what electrical engineers call "inductive reactance."

The battery, like a storage tank, can only hold so much. So, in order to prevent damage to the battery (caused by overcharging) and the electrical components of the car, a **voltage regulator** relay unit is required for both the A.C. and D.C. generator. It performs its function by sensing the voltage output of the generator and then regulating the generator field current so as to limit its output voltage.

Thus it is seen that the generator-regulator for the D.C. generator incorporates three control units while that of the alternator requires only one.

Correct Alignment Important When Installing Ventilated Points

With many of the late model engines using distributors with ventilated-type breaker points, particular care must be taken when installing these points to insure proper alignment of the contact surfaces. The contacts must be perfectly centered and strike squarely for maximum performance and long point life.

Alignment should be checked by turning the cam until the points close, then observing the position of the hole in the vented point with respect to the surface of the non-vented point.

If alignment is necessary, bend the stationary breaker arm until the points make full face contact. Never bend the moveable breaker arm when adjusting points.

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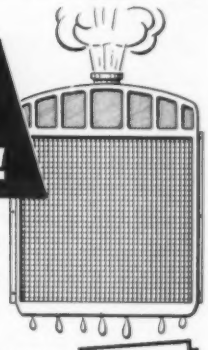

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The Right Price . . . (Continued from page 19)

at that, could hope to make it. Others were a push-over for any dub with a screwdriver and a pair of pliers. But time and experience have combined to equalize most of these errors.

A MATTER OF TIME

Actually, the "flat rate" was not a matter of price but of time. The time estimated for each job was translated into the charges made by the serviceman according to his hourly charge. These hourly charges, of course, were different in different shops and localities, but the mechanic was supposed to knock out the job in the same number of hours and tenths of hours, regardless.

Right off the bat the independent operators were in trouble, or they thought they were, because the dealer mechanic had parts on the premises while the independent had to scrounge the city for his. In fact, some of them sounded off so loudly about the inequity of flat rate labor estimates that some large independent publishers came to their aid by printing up flat rate estimates which allowed anything from half-again to twice the time that factory flat rate manuals allowed for the same operation. This went on for some time, with the independent sitting on top of the world. If a customer asked him how much a complete overhaul of the engine would cost, he'd consult his manual and find an allowance of say, 76 hours. He'd multiply this by his hourly rate and quote the price as his labor charge for the job, parts extra, of course.

COMPETITION AND LAW OF ECONOMICS

But it was right here that the old law of economics crept into the picture, competition being what it is. This same customer would then ask for an estimate from a dealership. The dealer mechanic consulted his factory flat rate manual, and came up with a time allowance of only 38 hours, which he multiplied by their hourly rate for a quotation of considerably less than the independents, even when the dealer's hourly rate was some higher. This situation couldn't endure in a business which was steadily becoming more competitive year by year, and it came to pass that flat rate allowances are about the same for dealer and independent.

Critics have always liked to point out the weakness in flat rate time allowances. They'd rant that the time study for the allowance was always made on new cars, that the field mechanic had a lot of mud and muck to scrape off before he could even begin work. The dealership mechanic often screamed bloody murder when he made his first repair to some new unit and found he'd used twice the time allowance for the job. He'd usually subside, however, after he'd done enough jobs on the unit to become accustomed to the operation and found he could beat the allowance.

Then, of course, flat rate got a bad name through the craftiness and stupidity of some individuals who always are in search for an opportunity to cheat on any rule or regulation dreamed up for any purpose. Mechanics who short cut operations to save time and risk come-backs were called "Flat Raters" to indicate they were willing to lay aside good shop practice in order to turn a fast buck.

They'd usually come up with the explanation that they could risk the few come-backs caused by shortcut operations, and then take care of them and have money left over from the jobs that didn't kick back, and thus beat the law of averages.

Estimators sometimes "fudged" on time allowances for certain operations by failing to subtract the time necessary to get the unit out of the car, when the operation was a part of a bigger job where it was removed anyway. For instance the overhaul of an oil pump might require 1 hour on the bench, but the allowance included R and R (remove and replace) so the full allowance was 2.5 hours. During a bearing job then, they'd charge the full 2.5 hours for overhauling the pump instead of the actual 1 hour allowance.

HELPS PREVENT OVER OR UNDER BIDDING

But when a more mature, over-all view of the value of standard flat rate allowances is taken, it can be seen that it gives the estimator his best and only chance of staying in the same ball field with a competitor who is also bidding the job and happens to know a lot more about it. It keeps the estimator from making such a ridiculously low bid that he gets the job and loses money on it, or from bidding so high he hasn't a chance of getting the job, and at the same time getting a reputation of holding his prices out of sight.

Any good journeyman mechanic likes to know how his speed compares with that of others in the same trade. There is no better way of learning if there is a faster or more efficient way of doing his job than comparing performance. It is also an indication that either inefficient equipment, or need for new equipment is present. Many fleet operators, service operators, and the military where the mechanics work on company vehicles on an hourly or weekly pay schedule make use of flat rate time allowance manuals to check to see if the operation is efficient. In other words, the time allowances are used as a "standard" for the operation rather than a basis for making customer charges.

Occasionally a critic of flat rate time allowances can be pinned down to pick the operations from the manual that he feels are impossible to meet. Usually he'll find only two or three that he feels he can't accomplish profitably. These will usually be no more than 2 or 3% of the whole. The suggestion for him then, is to mark up these few operations to

the point where he can make them. Perhaps the study was made with special equipment not available to him, or it may have been cut a little too close; everyone makes a mistake. There hasn't been any law forcing him to stick to every time allowance since War II when Uncle Sam surveyed service operation charges to safeguard against chiseling.

TOOLS AND EQUIPMENT PLAY BIG PART

The importance of proper tools and equipment is often demonstrated in the time allowance on given jobs. The same mechanic with the proper equipment may pare the flat rate allowance by several percent, if he has the special tools or machines necessary for the job. With only his hand tools, and possibly faced with the delay of sending parts of the job out for machine work, he runs considerably over the allowance.

Automotive factory zone service offices, despite their training courses, frequently encounter this variation in time required for the same job through their dealers. Their factory may agree to pay for some given alteration or replacement in the cars sold in the field. Some of their dealers will complete their allotted jobs without comment. Others will complain and try to have the allowance raised, since they can't make it for the allotted payment which is based on flat rate. The zone men say that this inability to make flat rate is usually traceable to the same shops that resist buying or using the special tools provided at the beginning of the model year.

PAYMENT METHODS VARY

Of course there is considerable spread in the methods of paying the mechanics for their work. Some pay on a straight percentage basis, others pay straight salary, a guaranteed minimum, or a salary plus certain profit sharing bonuses. All these methods have merit and usually fit the particular operation so that it is satisfactory to both the shop and the mechanic, or the system may have been reached through a union agreement. It is therefore difficult to state that any one method is better than the other.

Where possible, many operators have found that their flat rate time allowances can be used as special incentive which raises the output of their individual mechanics. If making flat rate is only so much hurry and bother for the mechanic, naturally he doesn't knock himself out trying to do so. But if he receives a percentage of the "gravy" when he is able to beat it, he has a financial incentive that promotes efficiency by rewarding it.

But some operators say they don't mind paying the incentive difference in making or beating flat rate allowances, providing they can get the type of mechanics who accept responsibility for comebacks in case their speed affects their accuracy. This is, of course, a requisite of this type arrangement, for it is the governing factor that keeps down the danger of hedging or shortcutting operations. For flat rate allowances are based on the premise that the job will be completed according to the best known shop practice and with whatever tools and equipment are necessary for each operation.

Regardless of the viewpoint taken on Flat Rate by those on opposite sides of the fence, in general it must be admitted that without it there is no standard for performance, or for estimating, or comparison for the hundreds of operations on dozens of makes and models of vehicles.

Flat rate is a serviceman's tool, which like any other tool, is only as good as the man using it.

Leaking Distributor Bushing Causes Breaker Points to Burn

Should you encounter a car owner who complains of constant distributor breaker point burning, yet the points are properly adjusted, regulator setting is okay, and the condenser is of correct capacity, check for an oil leak at the distributor base bushing. The use of the wrong grade of lubricant or excessive amounts on the distributor cam lobes also may cause this condition, especially if it is one which melts out at high temperature.

Incidentally, when installing new breaker points, be sure you clean the contact surfaces **after** installation to eliminate any possibility of contamination, a major cause of early breaker point failure. Also, remember that the engine should always be retimed after new points are installed, since point spacing has a direct effect on ignition timing.

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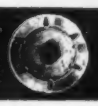


TRU-TORQUE
Product of Otto Items, Inc
1200 Reco Ave ■ St. Louis 22, Mo.

By J. EDWARD SCHIPPER
Detroit Editor

To drain or not to drain?

This is the big question now being asked by millions of car owners using "perpetual" and "all-year" coolants in their cars. For the present, at least, most car manufacturers are still recommending twice-a-year draining and flushing of cooling systems, plus the addition of a rust inhibitor.

• NEW FACTORS involving the cooling system of automobiles have created some entirely different situations as regards the springtime draining of radiators. The two factors which have exerted a marked influence on the picture are (1) the introduction of the so-called "perpetual" anti-freeze or coolants and (2) the rapidly growing use of aluminum cylinder blocks. While these two factors are widely different in their implications, they have combined in one sense to cause a considerable upset in the normal routine of handling coolants in a wide number of automobiles.

We were getting along very well with the standard ethylene glycols, plus their additives and inhibitors before the "perpetuals" and "all-year" coolants came along in the spring of 1960. Before that happened it was commonly recommended practice to drain the radiator in spring, flush it, add water and an inhibitor which would carry the cooling system through in good shape until it was time for the before-winter treatment in the fall.

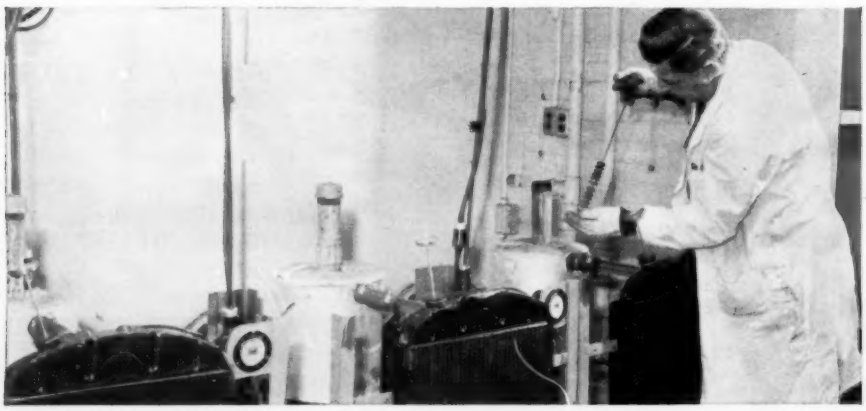
INTRODUCING THE "PERMANENTS"

An entirely new situation in the anti-freeze field was touched off when the Dow Chemical Company announced its Dowgard as a "permanent anti-freeze." Actually, it soon developed that "permanent" was not meant but it is an "all-year" coolant which eliminated the need for spring draining. With the anti-freeze business being as competitive as it is, it was not long before other major companies, such as DuPont and Union Carbide, also came along with "year-round" anti-freeze solutions which "did away with spring draining."

These announcements came after the beginning of the winter season of 1960 when car owners, almost universally, had already taken care of the anti-freeze needs for the 1959-60 winter season. However, a complete array of these new anti-freezes plus the old standbys were on the market for the winter of 1960-61 and it is this situation with which the service man will have to cope when it comes to spring draining this year.

For instance, the car owner who puts out possibly more than double the amount of money that he would normally spend to have his car treated with Dowgard "Full-Fill" (which is now guaranteed to require no draining for two years instead of the original one) would not like to have it dumped on the ground by some service station mechanic who believes in dealing along orthodox lines.

Dowgard Full-Fill is entirely different from the year-round anti-freezes put out by other companies such as DuPont and Union Carbide. Dowgard Full-Fill is a complete coolant using no local water but deionized water, plus inhibitors and other additives



Car manufacturers, together with chemical companies and others, conduct extensive tests on anti-freeze, radiators and other parts of the cooling system. Shown is apparatus for pumping heated anti-freeze through radiators for 2,500 hours. *(Photo, courtesy Olin Mathieson Chemical Corp.)*

which are designed not only to take care of extremely low temperatures but, "to remove the problem resulting from the use of local tap water which contains many dissolved minerals." ... Dow states: "Water picks up harmful substances such as minerals and gases as it travels through from the atmosphere to the cooling system. Hardness minerals, for example, build up insulating scale formations on the hottest surfaces where cooling is needed the most. Soft water, however, can also be harmful. Corrosive minerals, such as chlorides, sulphites and bicarbonites are usually found in soft waters. They attack metal surfaces to the point of breaking through so-called protective films, and even create a build-up of corrosion products."

For these reasons Dowgard claims that with its own deionized water from which all minerals have been completely removed, the cause of contamination of the coolant has been removed. Hence, they claim, there is no need of the usual spring draining.

In spite of this belief by Dow, stated at the time of the introduction of the Full-Fill coolant, this opinion has probably undergone at least a partial change. Dow chemists at the time of the introduction stated, "It is improbable that inhibitors will be developed which will protect engine metals equally well in all waters." However, in spite of this, Dow is just about to put on the market an anti-freeze which will be marketed this fall. The new product, called Dowgard Anti-Freeze, is a full-strength, single phase anti-freeze with an ethylene glycol base.

The new product contains chemically balanced inhibitors to protect the cooling system against rust, corrosion and foaming. Dow also claims that it will not leak out of a cooling system that is water-tight nor will it evaporate or boil away. Dow states: "Mixed with local water in a 50-50 mixture, Dowgard Anti-Freeze protects against cooling system freeze-up to temperatures of minus 34° F. The mixture will flow freely, keeping passages clean for the winter." Dow further states that corrosion studies in Dow's automotive chemicals laboratory show that the new product provides protection of all cooling system metals, particularly aluminum in both radiators and blocks.

The anti-freeze will be recommended for one winter's use only. The product will be marketed through automotive jobbers to service stations, automobile dealerships and independent garages wherever cooling system service is performed. While the Full-Fill product is considerably higher priced than the conventional anti-freeze, the new product will be priced similarly to those of other national brand anti-freezes.

DU PONT'S TELAR

DuPont Company put on the market in the spring of 1960 its "Telar" which they called a "never-drain type of automotive anti-freeze." In developing this product the DuPont Company continues the advantages of the ethylene glycol and water mixture. At the same time Telar contains a formula for the glycol-base anti-freeze, which, it is claimed, can be mixed with any drinkable water and left in the cooling system indefinitely. When DuPont introduced its Telar, the company stated that "this is the first anti-freeze and summer coolant that **never** requires draining from properly operated automotive cooling systems. It is a stabilized glycol anti-freeze containing new and improved corrosion inhibitors."

Realizing that it is possible for acids to get into the cooling system through a leaking head gasket, for example, or from residues of acid cleaners, Telar is provided with a safety check. Telar, in its normal or alkaline state is red in color. However, if acids have exhausted all of the inhibitor in Telar and the entire solution goes over to the acid side, the color will change from red to yellow. When this color change occurs, it is a signal that the coolant should be drained and discarded and necessary repairs made to the cooling system. DuPont's check shows that this is something which is rare—but can happen. When this is the case, the Telar cannot be reinhibited with any corrosion inhibitors and a fresh solution must be used.

Speaking of the possible causes of corrosive ma-

(Continued on page 74)

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Starting hard-to-start hot engines

. . . *Some helpful suggestions and observations on the subject, as passed along to us*

By DONALD CHILDS, Specialist
Automotive Training
The University of Texas

● YOUR ARTICLE entitled "Starting Hard-to-Start Hot Engines" in the November, 1960 issue was read with considerable interest. As you can imagine, this problem is very real to the automotive servicemen in the Southern areas during the summer months and we have had considerable experience in dealing with it.

I agree with the majority of your statements, but feel a few additional observations may be helpful.

THREE MAJOR FACTORS

First, it is understood, or should be, that there are three major factors to the operation of the conventional automobile engine. They are compression, ignition, and carburetion, and should always be considered in that order.

In relation to compression, we take into consideration the entire engine's mechanical condition. In addition to the mechanical factors you mentioned, I would like to add worn cam lobes and lifters. Cylinders unable to breathe correctly would contribute to hard hot starting when no choking is provided. This condition will quite often cause the engine to become extremely rough in the moderate speed range while perfectly smooth at idle and high speed.

It can be indicated by measuring valve travel and also indicated on an oscilloscope.

CHECK VALVE LIFTERS

The cylinder balance test is also effective. I would point out that with this condition, the compression test at cranking speed could show excellent. I point this out because in many cases a valve job alone without checking lifters does not improve the starting situation. Also in relation to the valve system, the oscilloscope is of tremendous value in observing sluggish and sticking valves while the engine is in operation.

In relation to the electrical system's portion of your article, I would like to extend my thanks for your stressing the use of the voltmeter and the oscilloscope. They are neglected as is most test equipment. In the electrical department. I would like to point out a troublesome situation which develops in city driven automobiles and usually in the larger engines.

CLEAN COMBUSTION CHAMBERS BIG HELP

Below normal operating temperatures and rich fuel developed during start-stop city driving can create a large carbon build-up in the combustion chamber. When cold, the engine will crank at the recommended rpm, but when heated and running clearances are obtained, the pressure becomes almost too great for the cranking motor to overcome. This causes very slow cranking, high current flow, and can lead to major cranking motor damage. Occasional trips at cruising speeds and combustion chamber conditioners are definitely in order for these units to improve hot starts.

Now let's get down to the most mistreated system on the automobile and the one with the most difficult job. Our problem is "Starting Hard-To-Start Engines."

The fuel system is made up of a tank, lines, pump and carburetor. The fact is that all these units or components are designed to handle only one thing—*liquid.*

HEAT ALWAYS PRESENT

Now let's examine almost any late automobile, especially with dual exhaust systems, and we'll find that the fuel line leaves the tank and moves on to within a few inches of the tail pipe. It then will parallel the pipe for, in some cases, as much as four feet.

The line then is carried forward along the outside of the frame and located only a matter of inches above the pavement until it reaches the fuel pump. The pump is never located in an ideal position in relation to heat. Last, we have the line from the pump to the carburetor.

My point is this—heat has been applied to the fuel system from and including the fuel tank to the carburetor. We have asphalt pavement hot enough to stick to your shoes, radiating heat against the lines and tank, plus the effect of the exhaust system. We have a fuel pump so hot it can seldom be touched; the pump to carburetor line and the carburetor are exposed to tremendous temperature.

When we have this situation and a fuel which starts vaporizing between 84° and 92° F., there is only one result —*vapor.*

Vaporizing of fuel in the system is the cause of the majority of the hot hard starting problems, not the carburetor.

VAPOR PRESSURE BUILDS UP

"Vapor-lock" is understood but what of percolation. For many years now, the carburetor manufacturers have designed units in which true percolation, causing fuel to be expelled to the bore, is impossible.

When a mechanic lifts the air cleaner and sees fuel spilling out of the discharge nozzle, what is happening? Vapor pressure building in the pump and line to the carburetor gets so great that it overpowers the fuel inlet system in the carburetor and excess fuel is forced into the fuel bowl. The bowl overflows and fuel passes out the nozzle into the bore.

To check this matter, we placed a cut-off valve and pressure gauge in the fuel line between the pump and the carburetor of a late model air-conditioned automobile to check pressure build-up in this line. After some city driving with air conditioner on, to get operating temperature, we then closed valve at carburetor and closed hood with engine off. After a 15-minute period a reading of 29 pounds of pressure was observed—more than enough to overpower any needle and seat and float system. The conclusion—the vapor had to go!

Your correction for this problem is in the right direction, but would not be effective in all areas and could be a source of trouble in itself.

RESTRICTION NOT THE ANSWER

When enough heat is applied to the fuel system between the pump and carburetor, the vapor formed will move directly to the highest point. Therefore, any "by-pass" should be taken from the highest point in this line to have maximum effect.

I would next point out that just placing a restriction in the line is not quite enough. The restriction should always be at the highest point. This is to say that the restriction should be located at the point at which the "by-pass" is joined to the pressure line near the carburetor. If the restriction is placed in any other position, it will simply provide greater liquid capacity in front of it and more area for vapor to form.

The .010″ opening in the "plug" would be entirely too small. It would be easily clogged and would not be able to handle the volume of vapor often encountered. The .010″ drills are not exactly common items. The

smallest supplied in the Carter set is .016″ and on air conditioned units, a .025″ to .030″ opening is not too large.

RETURN VAPOR TO FUEL TANK

If we had a steam boiler in operation and piped the high pressure steam back into the water inlet, I am sure you would agree we would be in trouble. The same is true if we pipe fuel vapor into the inlet of the fuel pump. There is only one point to return the vapor and that is the fuel tank. This allows the vapor to condense into liquid and return. This system is not new as you well know. It was used many years ago and is currently used by G. M. and Chrysler on limited units.

NOT A CURE-ALL

The by pass system in itself may not be a complete cure of the problem, and hot idle compensators, slotted throttle body gaskets, throttle body vents, etc., may also be necessary to overcome the problem of vapor which rises from the fuel in the carburetor bowl and settles into the bore.

Check Wheel Cylinder Boot

When customers complain of brake pull or erratic brake operation on their Plymouth or DeSoto equipped with "Three Platform" brakes, inspect front wheel cylinders for corrosion due to insufficient sealing between the wheel cylinder and dust shield opening.

The factory recommends that only the current rear wheel cylinder boot (Part No. 1136872) be used for replacement on the front cylinders of these brakes. When this boot is used on the front cylinders, care must be taken to insure adequate sealing with a good grade of non-hardening rope type sealing compound completely around the wheel cylinder to dust shield area.

Gas Heater Carbons Up

If carbon bridging occurs on early '60 Corvair gasoline heaters with the No. 3147598 spark plug, the factory recommends that a spark intensifier (P/N 5610491) be installed as follows:

Pull the high tension lead from the heater coil and cut the wire about 1½ in. from the coil tower boot. Screw the intensifier onto the longer part of the coil lead, and then into the shorter end, making sure both ends bottom in the intensifier. Then refit the lead into the coil. If the intensifier is installed on gasoline heaters with the F-12 plug there will be no damage, but no benefit will be obtained.

LOOKING FOR A JOB? USE OUR CLASSIFIED COLUMNS—PAGE 80

Comet Valve Lash Adjustment Revised

The production valve lash setting on 144 and 170 C.I.D. Comet engines is being set to a wider setting to preclude the possibility of valve damage from a valve lash adjustment which has been set too tight.

This wider production valve lash setting will in some cases generate valve noise. Therefore, it is of utmost importance that the valve lash be checked and adjusted by using a .015 in. "go" and .017 in. "no go" step-type feeler gauge to obtain the specified valve lash setting of .016 in. hot. Prior to checking valve lash, it is important that the engine be operated for a minimum of 30 min. at approximately 1200 rpm to stabilize engine temperatures. With the engine idling, check and adjust the valve clearance.

Lifting the Thunderbird

When raising a Thunderbird with a twin or single post lift, the rear axle should be utilized for raising the rear of the car; the lower suspension arms should be used for lifting the front. Caution should be used to position lift pad between the wheel and steering stop on the front suspension.

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Offenhauser dual manifold for the '61 Lancer

● STANDARD PRODUCTION of the 1961 Dodge Lancer specifies an intake manifold consisting of six, long curved tubes reaching from the single barrel down-draft carburetor to each of the six cylinders. The carburetor is designed to handle regular grade fuel.

The 170 cu. in. Lancer engine is a slanted six with overhead valves, a compression ratio of 8.2:1 and has horsepower output of 101 at 4400 rpm.

And now, along comes the Offenhauser Sales Corp. with a dual intake manifold to boost the horsepower of the Lancer engine. The name Offenhauser is, of course, well known in racing circles, since the "Offys" for so many years have performed so gallantly in the Indianapolis "500" and in races the country over.

Illustrated herewith is the dual manifold which accommodates two stock single throat carburetors. Installation is said to be simple, and after removal of the stock manifold, here is the procedure Dodge gives for the job:

Check carburetor butterflies to be sure they are closing properly. For proper idle it is recommended that automatic choke air bleed in the base of carburetor be plugged with lead pellets furnished in the kit. Place these on the manifold. (Tests conducted proved jets two sizes smaller than stock were most satisfactory).

Disconnect throttle shaft that extends from firewall. This must be done from driver's compartment. Cut shaft and straighten 2½" from bell crank. Carefully bend oil dip stick tube to clear the manifold. Remove old intake and exhaust gasket, carefully clean and install new one and also replace gasket that seals between intake and exhaust manifold heat chamber.

Replace the exhaust manifold on its studs. Tighten end nuts only *finger tight*. Now fit intake manifold into position, also *finger tight* on center stud only, connect intake manifold to exhaust manifold with three cap screws, tighten carefully to be sure intake and exhaust manifolds are properly sealed. When tightening the balance of studs start from center and alternate from top to bottom studs. By following this procedure the intake and exhaust manifolds will seat and seal tightly against the cylinder head.

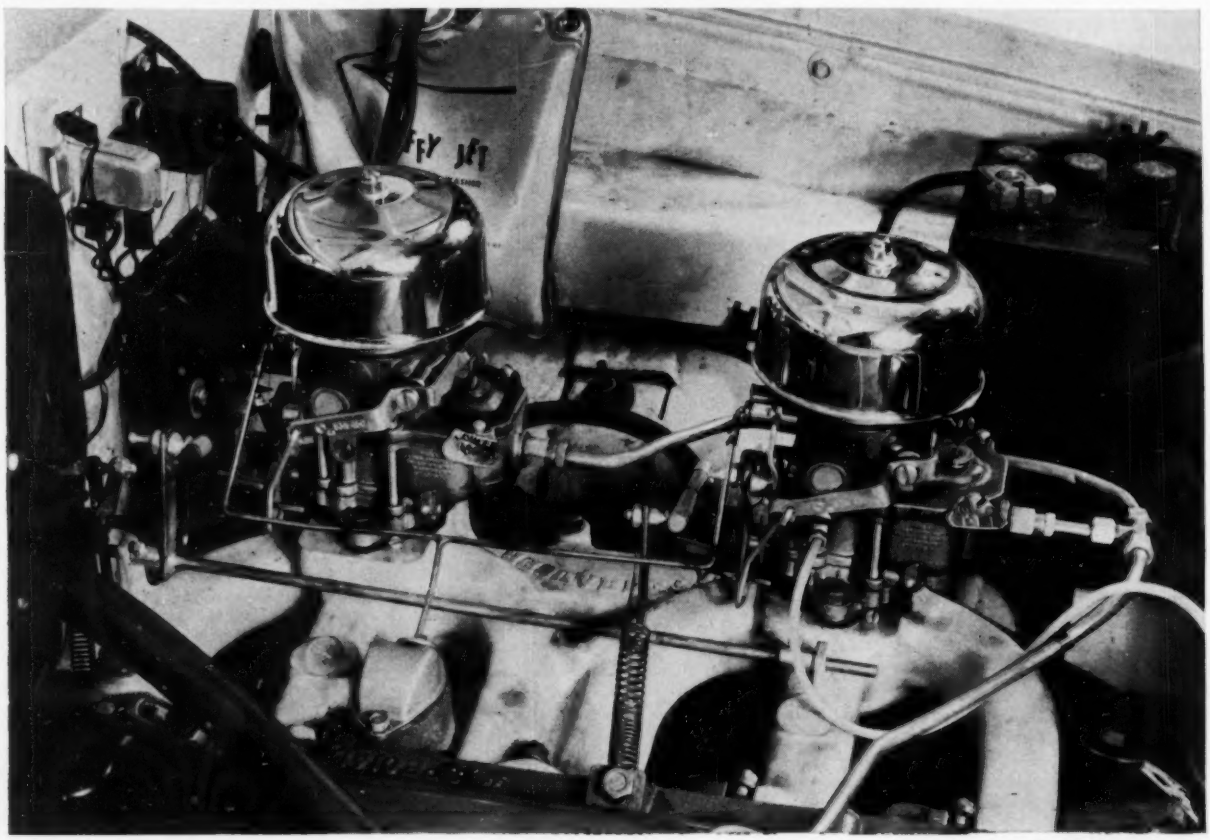
Connect carburetors with shaft. Be sure to place stops inside of cast brackets in manifold as it will expand when warm. If stops are on outside of shaft it will bind. Replace throttle shaft that was disconnected from firewall; also fit special shaft with connector into the throttle arm rubber grommet of rear carburetor.

Next, fit the shaft with connector attached to the shaft that was replaced into firewall. Distance from firewall to bell crank should be ¾ to 1 inch. This will vary slightly on different installations—it must work *freely*. If set correctly the shaft coming through firewall will be approximately in the center of the hole when in idle position. Also, the shifting control rod should not have more than 1/16" of pressure when in idle position.

The stock fuel line from fuel pump can be shortened. Now connect the carburetors and take the vacuum line off for the distributor from the front carburetor. A plug is furnished in the kit for rear carburetor vacuum takeoff.

No provision has been made for reconnecting the choke controls. If operated in extreme cold climates it is necessary to connect a manual choke

Offenhauser dual intake manifold installed on the 1961 Dodge Lancer 225 cu. in. engine, showing the choke linkage and fuel distribution system. The same manifold can be had for the 170 cu. in Lancer engine.



control. This should function very well off of one carburetor.

When the engine is thoroughly warm, adjust idle screws equally to obtain a smooth idle. (Additional spring pressure may be necessary.) Additional performance can be obtained by advancing the distributor about 4 deg. Naturally, to expect the most from this installation the mechanic should also check spark plugs ignition breaker points, ignition timing, etc.

A modified linkage, as shown in the "installed" picture series is necessary when this manifold is used on the larger "225" cu. in. engine for '61 Lancer.

Lacks "Solid Feel" On Light Acceleration

You may occasionally receive an owner complaint regarding a lack of "solid feel" on light acceleration on the 1961 Model Lark VI, especially during the later stages of the engine warm-up period; or, the owner may report a slight engine surge at steady throttle in the low or moderate speed ranges. These conditions may be more noticeable while the engine is new and its friction relatively high and are attributable to a carburetor with flow characteristics at or near the lean limit of manufacturing tolerances but still within the Studebaker specifications.

Assuming that the engine is otherwise in normal "tune-up" condition, either or both of the above mentioned operational characteristics will respond to the use of a different metering rod. Use Part No. 1553351 for regular carburetors and Part No. 1553350 for carburetors incorporating positive crankcase ventilation.

You should point out to the car owner, however, that the use of these metering rods will generally result in some loss in over-all fuel economy as compared to that which he has previously experienced.

Check for Spacer on Alternator Bracket

The alternator installation on the 1961 Dodge 170 and 225 cu.in. engines uses a stamped mounting bracket. The alternator mounts to this bracket by means of a single bolt through both alternator ears and the bracket. A spacer is used between the alternator ears to prevent collapse of the ears when the through bolt is tightened.

There is a possibility that some of the early production cars do not have this spacer installed. If missing, the factory recommends fabricating a spacer from standard iron pipe with a minimum I.D. of 7/16″; maximum O.D. 6/8″ and 2-3/16″ long.

Once in a Lifetime These Things Do Happen

● THE DRIVER of a 1955 Chrysler V-8 was proceeding peacefully on his way when suddenly there was an awful clatter in the engine, and it stopped very suddenly. It could not be turned over with the starter, so there was nothing to be done but get a tow to a nearby shop.

Since nothing could be told about

what had happened without removing one of the cylinder heads, this was done. When the head was taken off, the mechanic could hardly believe his eyes—the valve shown in the illustration was *lying on top of the piston* with the valve stem practically parallel to the plane of the valve head.

The cause of the trouble was a broken valve stem which let go at the valve stem locking groove. Then the valve dropped into the cylinder and was crushed between the top of the piston and the cylinder head, after which the broken end of the valve stem made a bull's eye hit on the spark plug and *punched it entirely out of the cylinder head* and jammed the piston so it would not move.

The strangest part of the whole accident was that the piston was apparently not damaged at all and was in usable condition. Why the piston head was not pushed in we will never know. The fact that the valve stem did not break off of the valve indicates what very tough material was in the valve.

New Seals Stop Leakage at Valve Chamber Cover Studs

According to Jeep Service & Parts News, a rubber oil seal and plain washer are now installed under the head of the valve chamber cover stud nuts on the Willys Model L6-226 engine to prevent any possibility of oil leakage at the studs.

The new oil seal (P/N 927013) and washer) P/N 120395) entered production effective with engine serial numbers S-16471, T-134501 and F-20951. Should oil leaks be encountered at the valve chamber cover studs on an L6-226 engine with serial number lower than the above, the new oil seals and washers should be installed.

To make your shop more profitable . . . your time more valuable . . . be sure to read this month's "These Are New" section

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SCHWARTZ

Hydraulically operated
RAMP HOIST
with WINCH

Eliminates towing — Saves on time and labor

- Mounts without removing truck frame cross member.
- Carries up to 14 tons.
- Fits all trucks 84″ to 174″ cab to axle.
- Hydraulic controls at *the side* of the ramp to give operator unobstructed view of operations.
- New combination fold-down approach plate, bumper, and trailer hitch.

DESIGNED FOR SINGLE OR TANDEM AXLES. ALL MAKES OF TRUCKS.
For full information, write Dept. RH-5

Here is the profit maker every auto salvage firm or body repair shop needs. Mounted on a conventional single or tandem axle truck, the SCHWARTZ RAMP HOIST requires just *one man* to load, transport, and unload wrecked autos because the entire job is done hydraulically. Lower the ramp in front of the damaged vehicle, attach the winch cable and the hydraulically powered winch pulls the wreck onto the ramp. The ramp is then lowered into place and you drive off at highway speeds. No hazardous towing. No need to disconnect transmissions.

You buy the SCHWARTZ RAMP HOIST as a complete unit . . . ramp, hydraulic mechanism, power take-off, and controls. Fold-down approach plate optional.

SCHWARTZ Manufacturing Co.
Lester Prairie, Minn.

These are new *manufacturers' products*

HOW TO GET RUSH INFORMATION

If you want further information or literature describing the products shown in our "These Are New" pages, just use the handy Business Reply Card you'll find further back in this issue. Whether you want information on one or more of the products, all that is necessary is to mail this Postage paid card properly filled out to AUTOMOTIVE SERVICE DIGEST. Our Reader's Service Dept. will contact the manufacturers directly and see that you obtain the requested information as quickly as possible.

Shock Absorber Tool

A new, specially designed shock absorber tool (No. 465) that will fit all makes of shock absorbers is announced by K-D Tool Co.

The head end of the tool, designed for a tight but easy-on-the hand grip, has three wrench openings which will fit any one of the stud-ends on different make shocks (including Delco) so that the piston can be held stationary while the mounting nuts are tightened.

The slim, but sturdy tool has an internally threaded end which reaches easily down through the mounting hole and threads onto the shock piston stud-end allowing it to be easily pulled into mounting position.

(Circle No. 1 on Reader Service Card)

Tune-Up Additive

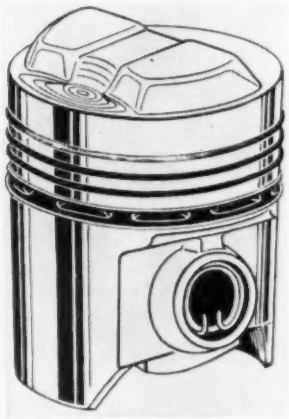
A new companion product to Motor-Medic has been announced by Radiator Specialty Co. Motor-Medic, the original product developed as an oil additive to stop oil burning and reduce friction in all automotive engines, will now be designated as Motor-Medic No. 1.

The new companion product which is added to the gasoline, will be marketed as Motor-Medic No. 2. According to the manufacturer, Motor-Medic No. 2 is a new scientific blend of solvents, lubricants and inhibitors for effective treatment of sluggish engines especially compounded to clean carburetors, free sticky valves, rings and parts, preventing corrosion and providing lubrication for upper cylinder valves.

(Circle No. 2 on Reader Service Card)

Fire-Ball Piston

The McQuay-Norris Mfg. Co. announces the addition of a newly designed Fire-Ball piston to their line of super power sleeve assemblies for tractors. The Fire-Ball piston has a patented, sculptured dome that is said



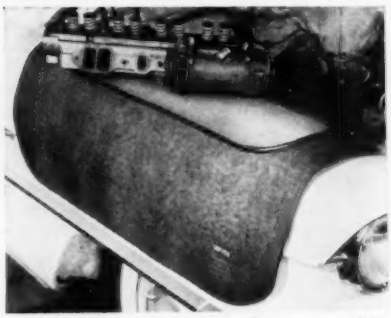
to increase compression and create a cyclonic turbulence for perfect mixture of fuel and air, and form a ball of fire at ignition that develops added power with fuel savings. Beefed-up pin bosses and head give extra strength for hard usage.

The new sleeve assemblies include heavy-duty piston ring sets with chrome top ring and oil ring, and spun-cast fine grain cylinder sleeves that are extra hard for long life. The I.D. of the cylinder sleeve is factory honed to assure proper wear-in for long ring life.

(Circle No. 3 on Reader Service Card)

Fender Cover

To eliminate "dimpling" of fenders while doing engine work, such as removing heads, overhauling power units, etc., The Allen-Rick Co. announces the "Grip-Tex" Fender Cover.



This new protector has an additional one-half inch thick piece of very firm rubber secured to the company's regulation all rubber fender cover. This protection for the crown of the fender is 36" long and approximately 10" wide and is permanently attached to the fender cover. According to the manufacturer, design of the cover is such that the crown protection not only insures against "dimpling", but because of its added heft increases the frictional grip of the all rubber fender cover.

(Circle No. 4 on Reader Service Card)

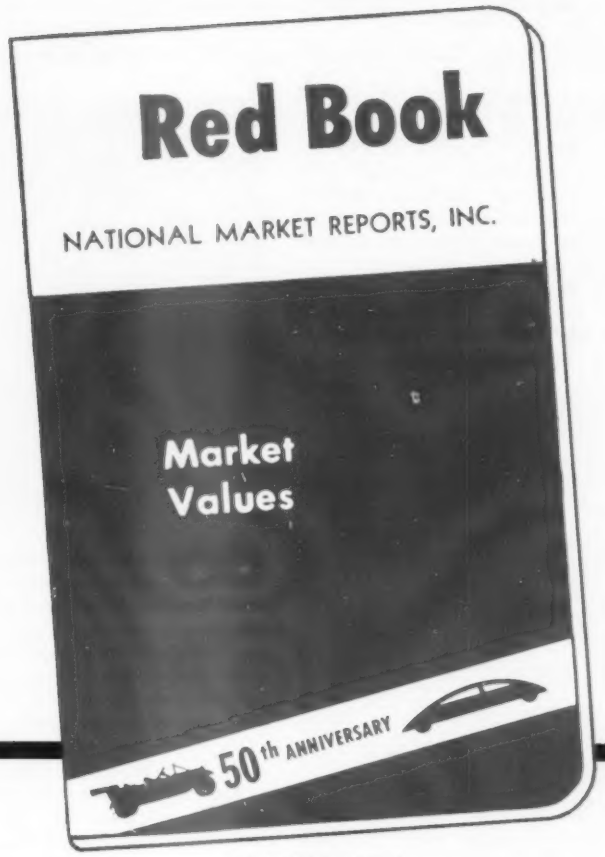
Worm-Gear-Drive Hose Clamps

The line of worm-gear-drive hose clamps recently introduced by Sterling Automotive Mfg. Co., includes the four popular automotive sizes as well as 12 sizes for all industrial, truck and tractor requirements ranging from a ¼ in. heater hose to a 4 in. radiator hose.

The Stamco hose clamp features perfect-circle sealing and a safety collar which is said to assure slip-free tightening. The hose-clamp band and housing are made of stainless steel.

(Circle No. 5 on Reader Service Card)

Do you need experienced help? Use our Classified Columns—Page 80



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Now dealers, salesmen, adjusters can carry in their shirt pockets CURRENT, up-to-the-minute used car market values (for their area) of all leading passenger cars for the past 7 years!

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900 South Wabash Ave.
Chicago 5, Illinois

These are new *manufacturers' products*

Generator-Regulator Tester

The new Auto-Ranger Generator-Regulator Tester, recently announced by Simpson Electric Co., automatically "senses" whether the charging system circuit of the automobile or truck is "standard" or "heavy duty", whether it has a positive or negative ground, and whether it is 6 or 12 volts. It is stated the mechanic does not have

to know these things about the circuit, which are sometimes difficult to ascertain.

Only one simple hook-up of the GRT leads is required for the performance of all generator and regulator tests regardless of the type of system being tested. And the GRT is said to even "verify" whether the hook-up is correct or not. After hook-up, a simple A, B, C procedure is followed in making an entire series of tests: A—select the test to be made; B—turn a knob; C—Read the meter, (and wherever possible the scales have "Good" and "Bad" bands which eliminate interpretation).

All tests are performed with all components on the car—nothing need be removed. And only one engine speed is necessary for all tests.

(Circle No. 6 on Reader Service Card)

Service Reminder Sign

Inasmuch as brake reline and wheel repack service jobs call for the use of hand tools, Chicago Rawhide Mfg. Co. has taken advantage of this by making available a 3½" x 10" service reminder sign on oil seals for attachment to shop tool boards. By making the sign available, C/R hopes to remind the mechanic, as he reaches for his tools, of the need to replace the old oil seals on brake relines and wheel repacks.

(Circle No. 7 on Reader Service Card)

Helper Spring Promotion Aids

A new promotional package offered by Hellwig Products Co. is designed to provide any automotive shop with the means of doing complete helper spring service work with minimum investment and maximum coverage.

The package includes: a mounted

helper spring display; a helper spring installation tool; a complete instruction manual on all Hellwig springs; all numbers of the Big 4 Helper Springs (full coverage of all American cars with leaf springs, and some foreign cars as well); two heavy-duty adjustable truck overloads which cover all late model popular pickups; an assortment of adjustable helper springs and stabilizers; window banners, wall posters, decals and sales literature to help promote and sell the line.

(Circle No. 8 on Reader Service Card)

Air-Powered Tire Changer

An air-powered tire changer—the Bell-Aire — recently introduced by Coats Company, Inc., uses neither a piston nor a cylinder but rather a new concept in air power called the Coats Air Converter. It takes the normal air pressure available in any service station or tire shop and converts it into such a tremendous thrust that even the toughest tubeless tire beads are said to be loosened instantly and without damage.

Developed by Coats after more than a year of research, the Air Converter used in the Bell-Aire is actually a combination super-tough neoprene expansion chamber and a linkage to produce proper bead-loosening action so simple in design and operation that it is expected to be virtually trouble-free.

All passenger and light truck tires —from 8 inches in diameter and up— can be handled by the Bell-Aire. Mounting and demounting are accomplished in the approved manner by means of the Coats Combination tool, which is included with the Bell-Aire.

(Circle No. 9 on Reader Service Card)

Lined Transmission Bands

New Raybestos automatic transmission lined bands for Cruis-O-Matic, Dynaflow, Ford-O-Matic, Hydra-Matic, Merc-O-Matic, PowerFlite, Powerglide, Teletouch and Turbo-Drive au-

tomatic transmissions are now available from the Raybestos Division, Raybestos-Manhattan, Inc.

The lining on these bands is the same as the lining supplied by Raybestos to original equipment manufacturers. Seven different proving ground tested linings, properly bonded to new steel cores, insure optimum service in each type transmission.

(Circle No. 10 on Reader Service Card)

Handy Tape Dispenser

Dutch Brand Plastic Electrical Tape is now available in a new and improved type of dispenser, designed to cut plastic tape in a novel puncture-

and-slice manner. This method, needing only one hand, is said to ensure clean straight ends that make for neater work and tighter splices. In addition, tape is not stretched during cutting, thus eliminating loss of dielectric strength and adhesion, often caused by breaking or stretching plastic tape.

Each dispenser contains 66 ft. of ¾ in. wide, 7 mil (.007 in.) thick Dutch Brand Plastic Electrical Tape. There is no danger of running short of tape because the contents of the dispenser, which is made of transparent lucite, are always visible to the user.

(Circle No. 11 on Reader Service Card)

Casite Additive Display

A new counter or shelf display for its additives has been developed by the Casite Division of the Hastings Mfg. Co.

The display holds one can of each

of four Casite additives, and serves as a constant reminder to car owners to buy Casite Motor Honey, Casite Tune-Up, Casite 3-C and Casite Smooth-Seal.

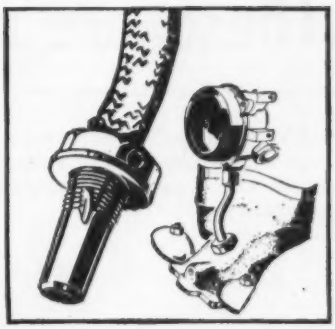
The display is packed in each "quad-pack" carton of Casite additives, and takes no more counter or shelf space than the cans themselves.

(Circle No. 12 on Reader Service Card)

Choke Tube Repair Kits

Houser Engineering & Mfg., Inc., announces two "do-all" universal choke tube repair kits which are said to permit rapid, efficient hot air transfer to the automatic choke without spurts or sputtering because of cold spots. Use of the kit is said to eliminate hard starts, overcome gas waste and carburetor failure and provide a fast, permanent automatic choke repair on Ford, GM and Chrysler products.

The heat element is screwed into the manifold and the copper line is seated in it. The top of the line is then inserted into the automatic choke inlet, and secured with a nut. The burned-out choke heater tube is plugged, pinched and left in place.



Service time is said to be just a matter of minutes.

(Circle No. 13 on Reader Service Card)

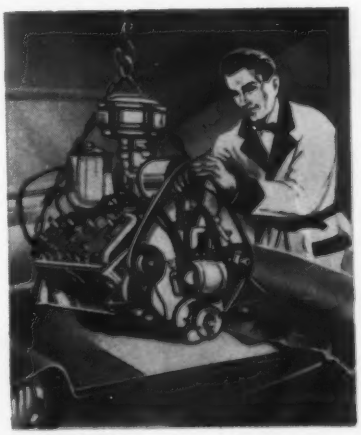
Mustang Mike Sez...

LOOK Fella! THESE MUSTANG REPLACEMENT ENGINES

They're Money-makin' Whizbangs!

- Dealers net easy $12 per shop hour profit
- Complete installation in 6 hours clears decks for another job
- Customer confidence and national acceptance thoroughly established through POST advertising

DEPENDABLE, precision-built MUSTANG REPLACEMENT ENGINES are proved big ticket, big profit items for any car dealer, garage or service station. Profit heaped on profit is assured from the sale of related parts plus liberal allowances you get on trade-ins.



MUSTANG comes as a complete package, *with all the gaskets*, all ready to uncrate and install as the sweetest running engine your customers ever had. Your jobber will cheerfully explain how to "get going" with the fabulous MUSTANG volume line.

"Better built for better performance"

MUSTANG DISTRIBUTORS CORP. TOUR

MUSTANG ENGINES

323 INTERNATIONAL ROAD • GARLAND, TEXAS

These are new *manufacturers' products*

Electric Engine Preheaters

A new thermostatically controlled external tank-type engine preheater line is announced by Phillips Manufacturing Co.

The thermostatic feature of the new model serves as an automatic shutoff should the engine reach preset temperature or should the unit have been improperly installed so as to restrict coolant circulation. With the new Zero Start External Tank-Type Heater, the coolant is warmed and circulated throughout the entire engine by thermosiphon action which, the manufacturer states, warms all moving parts of the engine to assure fast starting.

The heaters are available in six models from 450 to 2,000 watts in either 115 or 230 volts, each unit packaged complete with all fittings necessary, including a special "Y" fitting for directing flow of warm coolant through engine.

(Circle No. 14 on Reader Service Card)

One-Man Pressure Brake Bleeder

Eis Automotive Corp. announces a one-man pressure brake bleeder which comes with a complete set of up-to-date adapters specifically designed for use on 1960 Ford products, 1960

Chevrolet and GMC trucks as well as Oldsmobiles equipped with special power brakes. A self-sealing, quick-disconnect coupler is also available.

The new bleeder tank is fitted with a slide-on, all metal tool tray designed to fit all Eis tanks produced since 1945.

(Circle No. 15 on Reader Service Card)

AC-DC, Inert-Gas Welders

Two all-purpose AC-DC, inert-gas-shielded-arc welding machines, designed for operation from single-phase 230/460 AC power, have been announced by Hobart Brothers Co. Model ADI-2641 is rated 200 amps and Model ADI-3641 is rated 300 amps. By changing a switch, or by the use of simple plug-in controls and accessories, they can be used for manual, automatic, tungsten inert-gas, inert-gas spot or gas-shielded-arc consumable electrode welding.

Welding cables for both "TIG" and metal arc welding remain permanently connected, as a separate terminal provides for connecting the "TIG" torch. The operator merely flips a switch to choose between the two welding methods.

(Circle No. 16 on Reader Service Card)

Emergency Repair Vehicle

As an auxiliary service vehicle, to handle those minor emergency on-the-road service repairs, battery or

tire service or "parts chasing", the Cushman 780 Truckster has proven itself to be both economical and easy to handle in congested areas. The unit delivers up to 50 miles per gallon of gasoline.

(Circle No. 17 on Reader Service Card)

Brake Drum Lathe

Van Norman's Model 304-H "Super Duty" Brake Drum Lathe has a 14 in. spindle travel for maximum capacity, and requires no outboard support. It features instantly adjustable micrometer control, and feed and speed selectors, as well as an automatic feed stop. A built-in "scope light" highlights the full drum interior, assuring operator a better view of his work. A Vapo-Jet Dustless Grinder attachment allows the machine to turn and wet grind a brake drum at the same time.

(Circle No. 18 on Reader Service Card)

A-6

FLEET

AIR-POWERED

END LIFT

Quick, easy, safe lifting

Easiest to move. Big 10" Semi-pneumatic rubber wheels

Use shop air supply to speed up lifting. Easy one-hand operation.

High lift attachment available for tight under-chassis work. One-hand controls.

NAPA

Your NAPA Jobber is a good man to know. He stocks the complete line of Fleet lifting equipment.

EDGEWATER AUTOMOTIVE DIV.
St. Joseph, Michigan

Have You Used Equipment For Sale?
Use Our Classified Columns . . . Page 80

Holley Improves Dashpot

Engine stalling from sticking and excessive wear in the dashpot is said to be eliminated by the new service

dashpot recently announced by Holley Carburetor Company.

Holley designed and produced the new dashpot using DuPont's tough, durable Delrin, a chemical material selected for its properties of high resistance to corrosion and friction.

The Delrin dashpot (patent pending) is practically universal for servicing Ford built cars. It replaces six ordinary steel dashpots now carried in inventory by distributors and dealers.

(Circle No. 19 on Reader Service Card)

Generator Tool Kit

Generator and starter repair jobs are said to be accomplished quickly, easily and profitably with the new Generator Tool Kit recently announced by the Wesley Manufacturing Co.

The compact kit includes 12 pieces, made up of the following tools: *Speed-puller*—for extracting all makes of generator and starter bushings . . . Eliminates cutting out bushings with hammer and chisel. Comes complete with three quick-change taps plus Allen wrench. *Compensating adapter*—Permits locking entire armature into the lathe for machining, without removing pulley, bearing, end plate, spacer or woodruff key. Universal joint permits smooth, true turning. *Ford bearing cup center*—Allows machining the commutator without removing ball bearing. *Ford bearing puller*—If ball bearing must be pulled, this tool is said to do it quickly with a few turns of the wrist. *Bushing drivers*—Hardened steel driver shaft and three driver tips to seat new armature bushings of any size.

(Circle No. 20 on Reader Service Card)

Brake Fluid

A new Bendix heavy duty and super heavy duty brake fluid is now available from Bendix Products, which exceeds S.A.E. Requirements for both 70-R1 and 70-R3 types. The release of Bendix brake fluid fills a demand for a modern fluid to meet modern braking requirements. The addition of power brakes to a modern braking system creates requirements in fluid which were not recognized prior to their introduction.

Bendix brake fluid is available in 12 oz., 32 oz., 1 gallon, 2½ gal., 5 gal. and 54 gal. containers. The 2½ gal. container is a reusable type of can which can be used for gasoline or water after it is emptied of brake fluid.

(Circle No. 21 on Reader Service Card)

Since its inception by Shurhit in 1947, the Tru-Turn has proved itself in tens of thousands of applications to be the most practical and most satisfactory voltage regulator yet devised for general service work. It provides a simple, positive, screw-type adjustment which eliminates need for removing the cover, and permits accurate final volt-ammeter readings at the time the adjustment is made.

Shurhit Heavy Duty Tru-Turn Regulators give you more rugged quality — more real $$$ VALUE at no additional cost. Save time — speed up service with SHURHIT — the line of least resistance.

Shurhit WORLD'S FINEST IGNITION

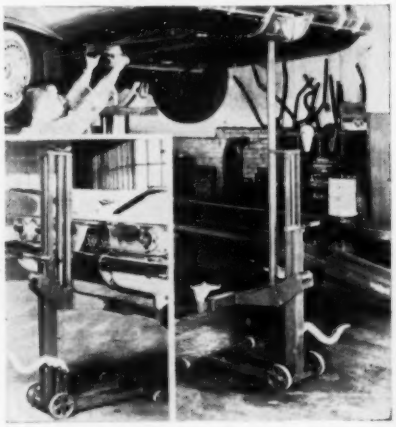
Shurhit PRODUCTS, INC., Waukegan, Illinois

WORLD'S FINEST IGNITION

These are new *manufacturers' products*

Hi-Lift Adapter for Bumper Jack

A new two-stage Hi-Lift Adapter, designed to convert its WA-52 Hydraulic Bumper Jack to a two-stage lift, has been announced by the Weaver Manufacturing Division of



Dura Corp. To broaden the unit's versatility, each of the two stages travels 29⅝ in., thereby greatly increasing the original maximum range.

The adapter, easily fitted onto the jack, can be used in the "low-stage" position for tire changing and brake service. If the self-storing "Hi-Lift" extension is raised, the unit is ready for use in general vehicle inspections, spring-insert replacements, and muffler and tailpipe repairs.

The entire unit can also be used with a twin-post lift to support the drive shaft during U-joint work, to support gas tanks and pans during transmission overhauls, and to support the engine during motor-mount replacements.

(Circle No. 22 on Reader Service Card)

Calking Strips

A calking material that can be thumbed into place quickly and easily in automotive repair work has been

announced by Minnesota Mining and Mfg. Co.

Called "3M" Strip-Calk, it is softer than similar products, but thicker beads are said to resist breakage and facilitate handling. It will bond to any surface encountered in automotive shop work, is waterproof and can be painted immediately after application.

The material will not shrink, remains soft and is black in color to blend with windshield rubber and other dark surfaces. Comes packaged in a flat box of 60 one-foot lengths.

(Circle No. 23 on Reader Service Card)

Wire and Cable Cart

A smart way to keep rewiring stock neat and handy when you need it is this new wire and cable cart available from your Autolite wire and cable source of supply. Holds up to 10,000 ft. of wire.

(Circle No. 24 on Reader Service Card)

Revolving Emergency Lamp

A new heavy duty 360° revolving emergency lamp with a lucite plastic one-piece lens and door is announced by Do-Ray Co., Inc.

The new lamp has been thoroughly tested by independent laboratories and is state approved.

The plastic lens is heat resistant and color fast. Available in 6 or 12 volts, the lamp has either a 2 or 3 sealed beam unit. Constructed for easy accessibility, the sealed beam unit can be replaced by simply removing three screws and lifting out the lens.

Base of the lamp fits either curved or flat surfaces to allow for all types of mounting. It attaches to cab roof with three toggle bolts. A heavy rubber base gasket gives tight, shockproof installation. Heavy-duty electric motor is safely enclosed within the lower housing of the unit.

(Circle No. 25 on Reader Service Card)

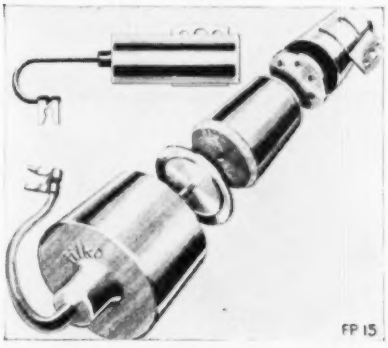
Truck Tire Rim Stand

The Branick Manufacturing Co. announces a new "Easy Way Rim Stand" for mounting and demounting truck tires and wheels easily and quickly. Handles 20″ rims and all truck wheels with disc. 22″ and 24″ adapters and safety inflation bar are available as optional equipment.

(Circle No. 26 on Reader Service Card)

Condenser Demonstrator

F. & B. Mfg. Co. states that their new Filko condenser is so importantly different that the only way to really



appreciate its advanced design is to see it disassembled, so that each of the component parts may be seen and examined. To enable customers to do this, they have made available to each Filko distributor, a special pull-apart demonstrator.

From its new formula steel shell to its special capsule with double layers of insulating paper between each layer of aluminum foil, this Filko condenser is said to be designed to perform better electrically and to stay efficient longer, due to its increased resistance to moisture penetration.

(Circle No. 27 on Reader Service Card)

Flat Oval Fiberglas Muffler

To meet the demands of today's highpowered engines and the modern low-slung chassis design of modern cars, Merit Mufflers announces a new flat oval Fiberglas muffler to fit nearly every model and make of car.

To provide both longer life and tone

control, the muffler has two types of Fiberglas packing—long thick strands which mat around the inner shell and batt type filler in the oval shell. Construction features include a double wrapped outer shell which is said to provide longer life. The oval is 3 in. by 6 in. with leakproof spun heads of 18 gauge metal.

The muffler's 22 in. shell length with various lengths of offset accordion nipples to match assorted car models, makes installation easier and eliminates any possibility of headcracking.

(Circle No. 28 on Reader Service Card)

Air Impact Wrench

A new air-powered automotive impact wrench has been developed by Thor Power Tool Co. with an oscillating impact mechanism that is said to make it possible, for the first time, to efficiently operate such a wrench off exceptionally-low air pressures of the

smallest shop compressors. The new wrench requires such small amounts of air to strike blows that its impact mechanism can be activated by human lung-power alone, according to the manufacturer.

The new Model WA4 wrench can operate at maximum efficiency off the low p.s.i. pressure of small compressors, extensive field tests have proven, yet it retains its efficiency at the high pressures of 110 p.s.i. or more required by other wrenches.

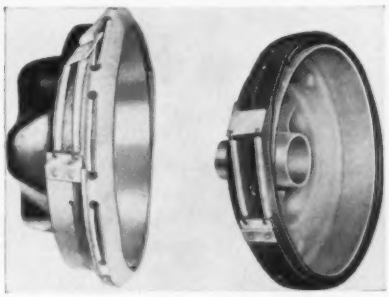
The new oscillating mechanism makes possible combination of motor and impact mechanism in a single compact unit no larger than a can of frozen orange juice. The oscillating design also is said to extend service life because it eliminates the in-and-out camming action of conventional air wrenches with revolving impact mechanism.

Statistics include: ½" square drive, 7⅛" length, 5¼ lb. weight, and 1,100 impact blows per minute.

(Circle No. 29 on Reader Service Card)

Drum Silencer Bands

New drum silencer bands being offered by Barrett Equipment Co. are now manufactured from gum rubber to provide greater resiliency and vibration deadening qualities. Split cen-



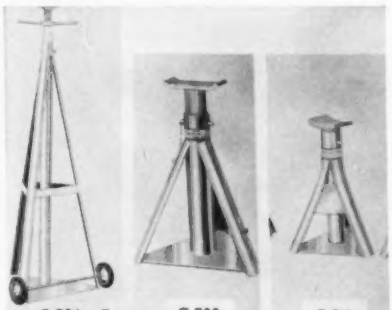
ter design curves over drum for even greater effectiveness and special spring clip provides for quick application and tension adjustment.

Fits all makes of brake drum lathes . . . available in two sizes, one for passenger car drums; the other for trucks, bus and extreme width passenger car drums. Tempered rubber drum silencer wedges are also available.

(Circle No. 30 on Reader Service Card)

Car and Truck Stands

Three new car and truck stands have been announced by Grigg Specialty Tools. G-704-B (left) is a new High Boy Stand with both fast slip



pin and threaded screw head adjustments. This stand is for use under hoist work. G-720 Atlas Stand (center) is a new super heavy-duty stand designed for heavy truck, tractor and road building equipment. Model G-711 (right) is a new extra heavy-duty all-purpose truck stand.

(Circle No. 31 on Reader Service Card)

Here is valuable information on every type of truck manufactured

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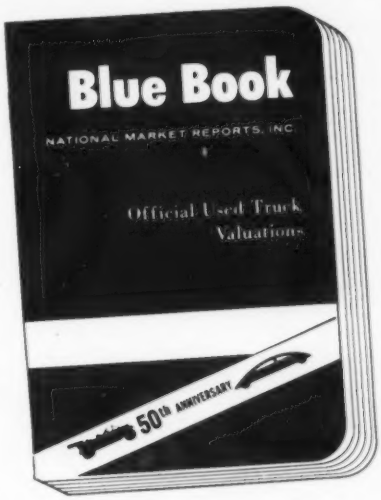

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• AUTOMOTIVE SERVICE DIGEST is specifically edited for the service specialists of the automotive industry . . . the men who keep automobiles on the road, performing at their best. From front cover through the "Smiles" page, all articles and departments are devoted to subjects and services that will help the man in the shop to do a better job, more profitably.

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"TECH KNOW-HOW" FEATURES

• ONLY ASD provides the automotive service field with timely, authoritative, detailed articles of this type. Prepared by men who have the actual experience, as well as the education to "live with" the increasingly specialized service needs of the modern automobile, these features go deeply into the methods and mechanical parts involved. Most "Tech Know-How" write-ups are step-by-step "how-to" descriptions of the latest procedures in a key servicing operation.

"BUSINESS KNOW-HOW" FEATURES

• COVERING the "dollar sign" side of our readers' information needs, ASD "Business Know-How" articles present management subjects from the specific automotive service shop viewpoint. They are written for owners and supervisory personnel by authors of recognized business-management ability; and are based on the actual day-to-day problems of a going automotive service establishment.

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TOOLS, EQUIPMENT AND SERVICES . . .

. . . reported and advertised in ASD, reflect important changes in your trade. Manufacturers and suppliers to the automotive service field are constantly developing new and improved shop gear. Their products make it easier, faster, more profitable to service cars better.

They also make it possible to gain competitive advantage by doing quicker, more complete or more satisfactory work. More versatile and special purpose "hardware" permits higher standards and new or expanded types of service with the same staff and building.

AUTOMOTIVE SERVICE DIGEST helps you get "full facts" on these developments faster; study them, and decide which fit your operation profitably.

Use the reverse side of the postpaid card above to make your selection from this month's reviewed or advertised products. The number system makes it a "quick business" to vote your choices; so that we can get you full details.

Be sure, too, to study every issue of ASD . . . keep your information up to date. Shop operators who are "too busy" to read for what's new and better, can be "cured" of that condition by competitors who take the time to look for and act on, information about the most modern tools of the service trade.

Please send me more information about the items identified by the key numbers circled below:

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THROUGH THE PAGES OF ASD . . .

. . . the most alert and searching eyes in automotive servicing pass carefully every month. Make sure that your own are equally "in the know"!

You owe it to yourself to keep pace with fast-moving technical developments in the field. AUTOMOTIVE SERVICE DIGEST, "Know-How" and Know-What" publication of your trade, can keep you "out of debt" on what's new.

Better maintenance and repair techniques pour out of engineering labs as regularly as new designs roll off production lines. Knowing and using the new "wrinkles" means better shop work—and more business coming in the door.

Information and instruction to turn that trick are yours in every issue of ASD. It talks shop language in authenticated and accurate "how-to" feature articles, which fit up-to-the-minute approved procedures to shop working specs. It goes into on-the-job points of practice as deeply as the mechanic himself must . . . and is unrivaled for thorough coverage of "live" shop technology.

You need ASD to keep fully informed —and get your fair share of the benefits from technical advances. USE THE CONVENIENT POSTPAID CARD ABOVE TO ENTER OR EXTEND YOUR SUBSCRIPTION—TODAY.

Ignition Parts Merchandiser

Shurhit Products, Inc., announces a new 1,000 Series line of cabinets and service stock combinations especially designed to provide flexibility for the

dealers needs according to the business volume and parts requirements.

This new modular concept in merchandisers consists of only three different cabinets and a pedestal base. Any cabinet can be used separately or in combination with any other cabinet in the series. Positive interlocking units permit "on the spot" assembly in a matter of minutes.

(Circle No. 32 on Reader Service Card)

Wash and Wax Car Sponge

Union Carbide's new "Prestone" brand name Wash and Wax Car Sponge is a specially designed sponge

loaded with detergents and water-activated silicones and waxes to deep wax a car in minutes as it is being washed.

Said to be ideal for popular acrylic and super enamel car finishes, the sponge contains no abrasives to scratch or mar. After the wash and wax ingredients have done their work (good for two wash jobs), the top quality sponge has many household and garage uses.

(Circle No. 33 on Reader Service Card)

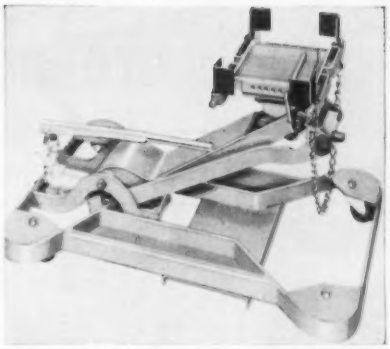
Transmission Jack

All automobile and light truck automatic and conventional transmissions are said to be easily handled and positioned by one man working from underneath with the new T-1 transmission jack recently announced by Blackhawk Automotive Division.

Featuring a high lift of 29 in., the T-1 can be used as a work stand if desired. The unit has a minimum low height of 6 in., capacity of 1,000 lbs., overall length of 32½ in., and a width of 21¾ in. at its widest point.

Four large swivel casters are spaced for maximum stability and permit smooth rolling of the jack to the job. Trays on either side hold tools and small parts.

The jack's pump handle rotates a full 350 deg., while the large saddle



tilts 56 deg. forward, 6 deg. backward and 12 deg. to either side.

(Circle No. 34 on Reader Service Card)

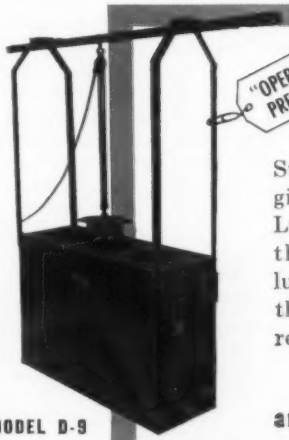
PREFERRED everywhere!

S-V

CAMSHAFT GRINDER

Storm-Vulcan built the first camshaft grinders for engine rebuilders and automotive machine shops. The engineering design of Storm-Vulcan Camshaft Grinders assures accuracy within .001" of lift and 1° of specified timing. Camshafts ground on the precision engineered S-V Camshaft Grinder assure you the best engine performance.

MODEL 75



DURALUBE LUBRITE PROCESSING UNIT

Storm-Vulcan Model D-9 Lubrite processing gives lasting life to reground camshafts. The Lubrite process is an acid etching which opens the pores of the metal and affords positive lubrication. Eliminate camshaft failures with the use of the S-V Duralube process on every reground camshaft!

MODEL D-9

Every Rebuilt Engine Needs an S-V Reground and Lubricated Camshaft!

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MANUFACTURERS OF AUTOMOTIVE ENGINE REBUILDING EQUIPMENT

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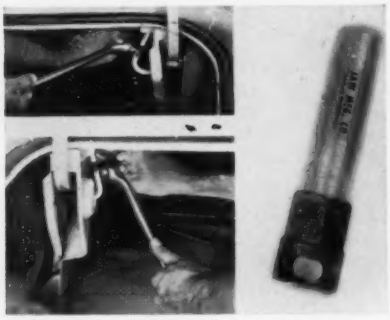
These are new *manufacturers' products*

Deck-Spring Torsion Rod Tool

A new tool for adjusting, removing and replacing the torsion rod spring on automobile deck-lids is announced



by the Jaw Mfg. Co., who reports that these springs are heavily preloaded and have presented difficulty when working on them.

It is stated that the Jaw No. 200 Tool will remove, install or adjust the deck-lid torsion rod spring on most cars in a few seconds with the utmost confidence and safety.

As shown in the illustration, this compact tool is used with any 1" box wrench to obtain maximum leverage for easy operation. Once the tool is properly engaged, it cannot slip, skip, or otherwise "misfire", according to the manufacturer.

(Circle No. 35 on Reader Service Card)

Distributor Tester

A new "Allen-Tronic" Syncrograph, featuring 8,000 rpm, new safety features in distributor chuck, and AC operated (no battery needed) has been announced by the Allen Electric and Equipment Co.

This new Syncrograph (Model E-1416HD), makes all the electrical

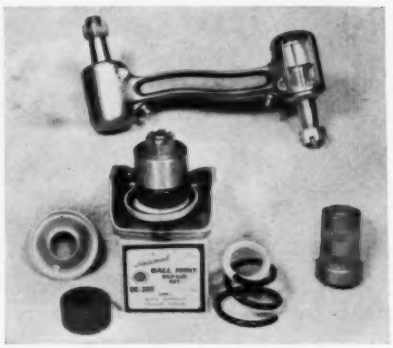
and mechanical tests needed to properly calibrate the distributor for correct timing and advance. Supplied in the new "Allen-Tronic" colors, it will test 6, 12, 24 and 32 volt single or dual point distributors. Powerful motor will drive all distributors up to 8,000 rpm. This unit has precision meters with a point dwell range of 0-80° for late model and foreign cars. All test selectors and controls are conveniently grouped on one panel and clearly identified for ease of operation.

Personal in-the-shop instruction by an Allen-trained representative is provided in addition to complete, printed operating instructions and specifications.

(Circle No. 36 on Reader Service Card)

Front-End Parts

Just eleven "Adjust-A-Matic" idler arm, ball-joint and idler arm kit numbers, being offered by National Machine Works, replace up to 38 part numbers of other lines required to make front-end repairs for most popular cars. According to the manufacturer, this means a reduction in



inventories of 400 to 500 per cent, faster repairs, greater profits and more repeat business from satisfied customers. The "Adjust-A-Matic" parts are said to be precision engineered for lifetime use—they adjust automatically, compensating for wear as it occurs.

According to National, front-end shops using "Adjust-A-Matic" parts offer customers easier handling, with the feel of power steering; longer tire life and mileage, stopping most toe-in changes; parts never need adjusting, providing positive control of steering adjustment. Heavy duty bearings, friction loaded to absorb road shock and sealed to eliminate damage and wear, caused by sand, water and grit, provide greater safety . . . lasts the life of the car if properly lubricated.

(Circle No. 37 on Reader Service Card)

Midget Open End Wrenches

A set of eight midget open end ignition wrenches with 15° and 60° heads in sizes from 13/64 to 11/32" is announced by Vlchek Tool Co.

The two openings on each wrench

are duplicated on another, but at different head angles, thus providing a complete range of openings for each angle. In addition to the eight obstruction-type wrenches, the set includes a midget ignition plier, 4½ in. long. Tools are forged from finest alloy steel, heavily chrome-plated and polished, and assembled in a handy pocket roll.

(Circle No. 38 on Reader Service Card)

NO-MAR Tow Bar

For Passenger Car Towing

ATTENTION WRECKER OPERATORS

Have you paid the price of this Towing Hitch in replacing damaged bumpers; or lost friends and customers by damaging their cars in tow?

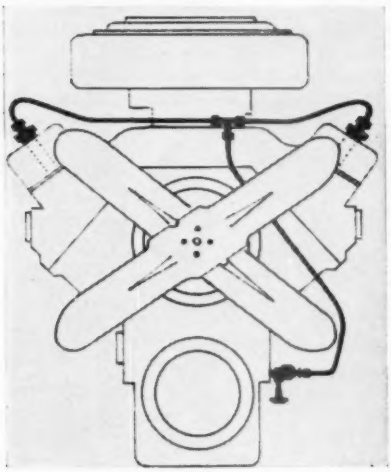
We cannot tell you in this small ad all that this Tow Bar can do for you. So write for details at once!

E. R. BUSKE MFG. CO., Inc.

DEPT. SD POCAHONTAS, IOWA

Rocker Arm Oil Kit

According to Thexton Mfg. Co., sludge in rocker arm oil lines in Ford V-8's and Chevy 6's causes clogging that leads to noise and eventual dam-



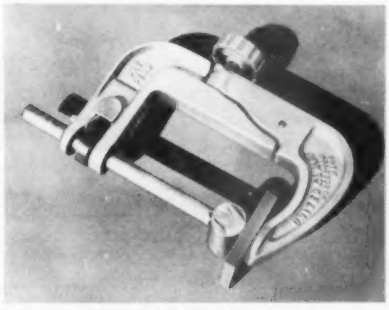
age. In the past, this problem has always led to extensive, time-consuming repair efforts.

To correct this trouble, Thexton is now offering a simple to install rocker arm oiler kit that is said to provide a properly restricted exterior oil line to assure sufficient oil to the rocker arms for new-car, noiseless operation.

(Circle No. 39 on Reader Service Card)

Quick-Action C-Clamp

United Associates announce a new, finger-tip control, quick closing and opening, threadless C-clamp. The threadless spindle eliminates frame



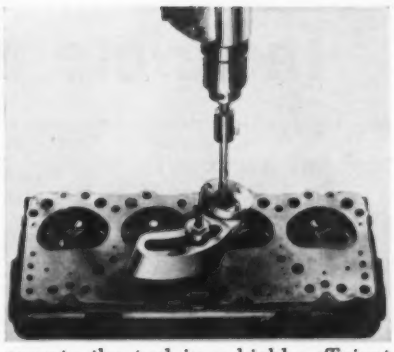
twisting from tightening; anvil and spindle do not turn while pressure is being applied and as a result, materials held are said to be free of clamp marks. The clamps can be furnished with either anvil or vee spindles and are available in 2", 4" and 6" sizes. Brackets can be obtained to permit the clamp to be used as a bench vise.

(Circle No. 40 on Reader Service Card)

Valve Guide Servicing Tool

A new valve guide servicing tool has been developed by Hall-Toledo, Inc., to enable engine rebuilders and mechanics to quickly and accurately ream valve guides oversize to the engine manufacturers original specifications, and for core drilling integral valve guides for the installation of replaceable valve guide bushings.

The new tool is said to have the unique feature of aligning itself to the valve guide through a combination valve seat and valve guide adapter, thus assuring perfect direct center line concentricity. The Model GT can be used readily with either a drill press or hand drill, and is fast, efficient and economical. According to the manufacturer, even the most inexperienced operator can set up and



operate the tool in a highly efficient manner.

(Circle No. 41 on Reader Service Card)

The Word is Out!
IT'S THE SECRET TO BIG PROFITS WITH NO PROBLEMS!
THE Apache
MODEL 310
MOTOR STEAM CLEANER
Designed Exclusively
FOR THE AUTOMOTIVE INDUSTRY
Cleans Engines, Motors and Equipment quickly and efficiently.
The Apache is sold exclusively to automotive jobbers.
Delivers 100 pounds of saturated steam within 90 seconds.
Big 70 gallon capacity.
Fully automatic-push button control.
Completely portable-mounted on E-Z Roll wheels with semi-pneumatic tires.
Equipped with hose, steam gun and hot water rinse attachment.
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BLAST IT CLEAN WITH HIGH PRESSURE STEAM!

These are new *manufacturers' products*

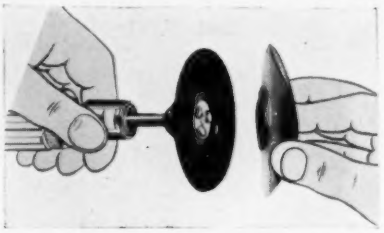
Speedlok Abrasive Discs

Speedlok Grinding Discs, recently announced by Legvold Enterprises, Inc., employ an entirely new method for instantly locking or removing abrasive discs without use of spanner wrenches.

The Speedlok Disc will securely lock to holder with thumb pressure against center and slight clockwise turn of disc. A reverse turn instantly removes it . . . no pressure sensitive adhesives are used.

A big feature is said to be the fact that Speedlok discs are always absolutely centered, avoiding vibration; the elimination of center metal fasteners leaves the full surface as an effective working area removing danger of metal hitting work.

Another feature of the discs is the flexibility of holder to permit contour grinding, edging, etc. The continual flexing of disc in use is said to discharge from it all paint or other



ground materials, thus extending cutting efficiency.

A tough new type of backing material also is used which offsets the tendency of abrasives to become embedded. According to the manufacturer the improved back as much as triples the effective life of the abrasive edge.

(Circle No. 42 on Reader Service Card)

Transmission Parts Cleaner

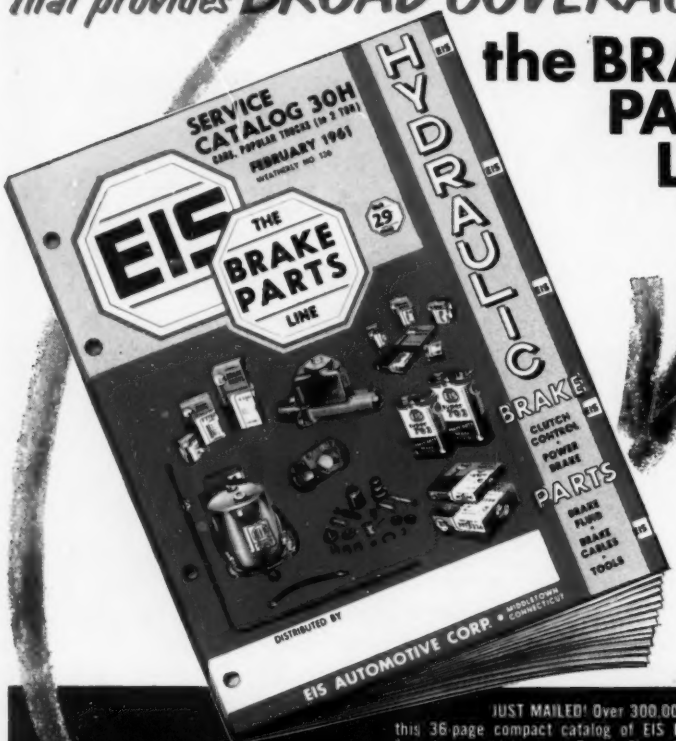
Trans-Clene Transmission Parts Cleaner, recently announced by Graymills Corporation, is said to be the first cleaner specifically compounded for cleaning "varnish" and carbonaceous coatings from the intricate valve bodies, valves, pumps, plates and delicate parts of the automatic transmission.

According to Graymills, these hard to remove coatings are quickly stripped off or softened so they can be flushed away with milder solvents or water after parts are cleaned in Trans-Clene, which is compounded with special inhibitors that makes it safe to use on aluminum and die cast parts.

Non-inflammable, it is available in 6, 16, 30 and 55 gallon containers; the 16 gallon container coming complete with a dip basket for handling all internal transmission parts.

(Circle No. 43 on Reader Service Card)

if you service brakes, you need this *New.. COMPACT CATALOG* that provides *BROAD COVERAGE of* the BRAKE PARTS LINE



JUST MAILED! Over 300,000 copies of this 36-page compact catalog of EIS Brake Parts have been sent to every Repair Shop, Service Station, Garage, Car Dealer and Fleet Owner in the country! It contains complete information and specifications for standard passenger cars, compacts, imported cars and popular trucks (to 2-ton). The catalog lists hydraulic brake parts . . . fluid, cables, tools, clutch controls as well as power brake parts. A special section is devoted to time-saving shop hints. If you didn't get your free copy of this valuable catalog, start writing now, or . . . ASK YOUR EIS DISTRIBUTOR!

39 Strategically Located Warehouses to Serve You
EIS AUTOMOTIVE CORP., Middletown, Conn.

WHEN CHANGING YOUR ADDRESS

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200 gph Steam Cleaner

The introduction of a new 200 gallon per hour steam cleaner by the Clayton Mfg. Co. now gives this firm a complete cleaner line ranging in output from 60 to 600 gph. The all new Clean-Master "200" is a ruggedly de-

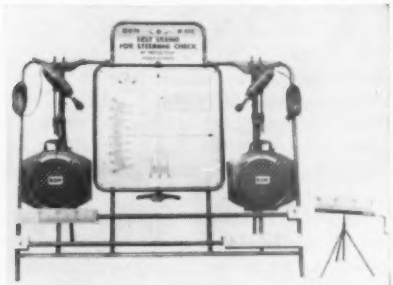
signed and built cleaner rated to deliver 200 gallons of balanced, high impact vapor cleaning solution per hour. Equipped with remote automatic control as part of the standard equipment, the unit is in full operation only when steam cleaning is actually being performed.

The "200" is available in natural gas, LPG, and oil fired models, and in stationary, trailer, or dolly mounting. The electrical system is fully weather protected with electric controls housed in a totally enclosed weatherproofed cabinet.

(Circle No. 44 on Reader Service Card)

Wheel Alignment Unit

Western Services Corp. announces a wheel alignment unit incorporating the Muller "Bem 665" light beam



system which is said to give direct reading of all checks in 15 minutes without the need for reflected mirror beams, complicated mechanical devices and obstacles to perfect reading.

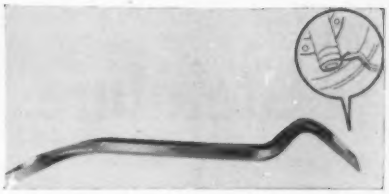
The unit's self-leveling panel eliminates the need for an absolutely level floor. Direct readings of front and rear ends are projected even while alignment adjustments are being made.

Included with the unit are projectors, angle chart panel, front-rear alignment and toe-in, toe-out gauges, turning plates and optional tripod with scale.

(Circle No. 45 on Reader Service Card)

Bendix Brake Adjusting Tool

Proto Tool Co's. No. 2011, Bendix brake adjusting tool, is similar to standard brake spoons but has a special modified end to clear the suspension systems on new Corvairs, Chevrolets and Buicks. The modified end is beveled to turn adjusting star screws positively, while permitting the user to reach the adjusting slot from

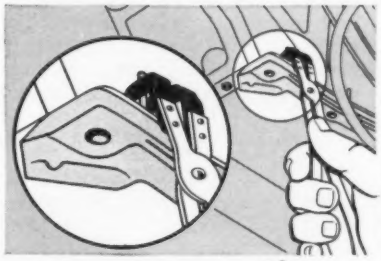


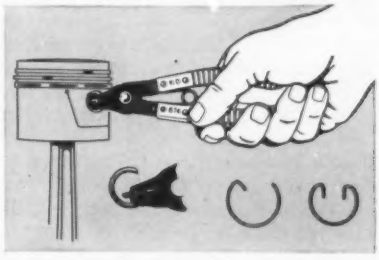
a wide angle to clear suspension system obstructions. The opposite end of the tool adjusts all other Bendix brakes.

The tool is hot-formed in special alloy steel, chrome plated, and 9 in. long for good leverage.

(Circle No. 46 on Reader Service Card)

3 FOR THE MONEY— AND ALL NEW!—FROM K-D





1 No. 475 Crankcase Rubber Gasket Pliers

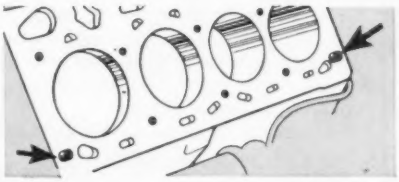
A must tool for new Plymouth 6's, Dart 6's, Valiants and Lancers. You can't replace the gasket without them. Angled jaws let you reach up and over crankcase flange and pull rubber nibs completely through—they can't be pushed through; they must be pulled.

$1.75, Eastern resale—slightly higher in West

2 No. 874 Piston Pin Lock Pliers

Specially notched jaws assure bulldog grip. Just a slight twist removes or installs wrist pin lock ring.

$2.45, Eastern resale—slightly higher in West



$1.35, Eastern resale—slightly higher in West

3 No. 480 Head and Gasket Aligning Tool. Makes easy work of placing both head and gasket, especially on V-8 and slanted engines. Aligning buttons (set includes two 7/16-in. buttons, two ½ in.) are placed in head bolt holes. Gasket is guided to place by buttons. Head is aligned in the same manner. After head is secured with several of its bolts, a pulling rod with pin and spring catch is inserted through bolt heads to trap and remove buttons.

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K-D TOOLS *Make Hard Jobs Easy*

K-D MANUFACTURING COMPANY

Lancaster, Pa.

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manuals, catalogs and charts

most items are yours for the asking

RADIATOR CORE CATALOG . . . McCord Corporation's new 76-page radiator core catalog (No. 190) illustrates and describes the six types of radiator cores used as original equipment on virtually all water-cooled, internal combustion engines. Imported cars are listed in alphabetical order with domestic passenger cars. Also listed are car heater cores following each passenger car application. The catalog also contains a chart of radiator cap relief valve pressures in pounds for all model cars from 1952 through 1960. Latest information concerning tank and channel parts including oil coolers is available for 1960-'61 Ford, Falcon and Comet cars, and for Chevrolet passenger cars up to and including 1960.

(Circle No. 47 on Reader Service Card)

F-6
FLEET
Hydraulic
SERVICE JACKS
Speed up tire changing, brake service, all under-chassis jobs.
A size for every service need
Built for years of trouble-free service. Easy to handle, fast-acting. Foolproof release valve and overload safety valve.
NAPA
Your NAPA Jobber is a good man to know. He stocks the complete line of Fleet lifting equipment.
CAPACITIES:
1¼ ton
1½ ton
2 ton
4 ton
10 ton
20 ton
EDGEWATER AUTOMOTIVE DIV.
St. Joseph, Michigan

BODY-FRAME REPAIR EQUIPMENT . . . 16-page catalog (L-1623) describes and illustrates John Bean body and frame repair equipment available. Models utilizing mechanical or Visualiner optical-type systems include floor- and pit-type units, short-pit collision groups, portable aligners, modernizer kits for all types of equipment, and allied gauges, tools and accessories. Photos of typical operational set-ups are also included.

(Circle No. 48 on Reader Service Card)

OIL SEAL POSTER . . . A new, two-color window-wall poster that sells oil seals by promoting brake relining and wheel repacking is offered by Chicago Rawhide Mfg. Co. The 20" x 30" poster contains an illustration designed to cause vehicle owners to ask about oil seals so as to offer servicemen the opportunity to talk about brake relines and wheel repacks.

(Circle No. 49 on Reader Service Card)

"SOLDERING SIMPLIFIED" . . . is the title of a manual being offered by Kester Solder Co. which is said to be probably the only book exclusively devoted to teaching the fundamentals for obtaining perfect soldering results in a step-by-step manner. Different types of solders and fluxes, and their composition are discussed. Soldering techniques, proper heat application and the correct pre-soldering and post-soldering metal-treating procedures are thoroughly covered, as are different equipment types, their correct use and care.

(Circle No. 50 on Reader Service Card)

1961 TUNE-UP CHART . . . Easy-to-use 20-page, indexed flip chart offered by Guaranteed Parts Co., lists specifications for all passenger cars, including the 1961 models and compacts. Also gives a complete listing of ignition service parts numbers necessary to repair distributors, generators and starters . . . plus ignition coils, resistor units, horn relays and switches; starter, dimmer and stoplights. Another section gives detailed information on proper methods of pushing and towing automatic drive cars.

(Circle No. 51 on Reader Service Card)

SMALL ENGINE PARTS . . . Catalog (No. 701) available from The Echlin Mfg. Co., illustrates their ignition parts used on lawn mowers, chain saws, garden tractors and other small engines. Divided into four basic sections: First, the engine model parts guide, listing parts data by engine, make and model; second, the magneto model parts guide where parts information is listed under the magneto, make and model. Third is a listing by equipment manufacturer's name and model, and the fourth section lists all Echlin parts by part numbers, with individual illustrations of each and every item in the line.

(Circle No. 52 on Reader Service Card)

ALTERNATORS . . A two-page data sheet describing the engineering features of its new 6000 Series 40-ampere alternator system for cars and trucks is available from Leece-Neville Co. Fully illustrated, the literature provides wiring system diagrams for positive and negative automotive ground systems, illustrates and describes significant alternator dimensions, lists products operating and engineering data, as well as all mechanical advantages and exclusive design features of the unit.

(Circle No. 53 on Reader Service Card)

WIRE, CABLE & BRAKE PARTS . . . MoPar Parts and Accessories, Chrysler Motors Corp., announces two new catalogs designed to make it easy to "sell" fast moving, high profit, wire, cable and brake parts. Each catalog lists applications for Chrysler-built vehicles, including '61 models. The profusely illustrated catalogs contain many service tips and many illustrations to help make repairs, replacements and specifying much easier.

(Circle No. 54 on Reader Service Card)

REPLACEMENT FILTER CHART . . . A complete and functional four page oil, air and fuel filter refill specifications wall chart, available from Purolator Products, Inc., lists the replacement filters for American and foreign cars and light trucks and has simplified cross reference charts of all filter

You may want this information, and most of it comes to you free. Just circle the key number on the Reader Service Card corresponding to the one that appears with the editorial review. Our Reader Service Department will forward your inquiry to the manufacturer or supplier for attention.

stock numbers. In addition, the chart has a new "How to Sell" and "Product Story" section.

(Circle No. 55 on Reader Service Card)

CART RACING . . . 1961 Palmini Engineering Corp. Cart Racing & Power Catalog contains complete sections, fully illustrated, devoted to each engine . . . listing parts and all accessories available. Also sections on wheels, reeds, adaptors, stuffers, gas tanks, etc.

Price of catalog, 50c. Order direct from Palmini Engineering Corp., 3156 N. San Gabriel Bldg., Dept. ASD, South San Gabriel, Calif.

THERMOSTATS . . . New Stamco thermostat and hose clamp catalog (No. 61), available from Sterling Automotive Mfg. Co., describes the company's new lines of original-equipment-design thermostats, worm-gear-drive hose clamps and water outlet gaskets. Provides complete ordering, application and technical data, as well as pricing, packaging and display information on all three products.

(Circle No. 56 on Reader Service Card)

BODY PANELS . . . A 15 x 24 in. wall chart with a built-in pocket containing a kit of sales and technical literature describing the complete line of Slip-On Appearance Panels is available from Slip-On Corp. Sales kit includes complete company catalog, together with supplementary sheets of up-to-date parts. Also contains order guide and price list, as well as illustrations of advertising mats available.

(Circle No. 57 on Reader Service Card)

TACHOMETERS . . . A Tachometer Facts Folder, available from Sun Electric Corp., points out all the benefits that tachometers offer to users in the truck, sport and racing cars, marine and industrial markets.

(Circle No. 58 on Reader Service Card)

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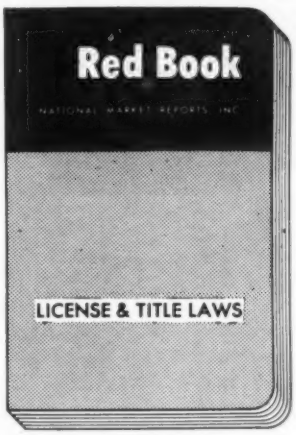

1961 license & title data

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When you buy, sell, trade or finance automobiles, you need this valuable guide to State license and title laws. Facts, figures for all 50 states are included. Tells you where records are kept, ownership proof, accident reports, service on non-residents, financial responsibility law, motor vehicle enforcement, administrative agency, official's name, address and state. Shows license plates of all states printed in actual, official 1961 state colors and many other important and often hard to find license and title data. Order your copies today.

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To Drain or Not to Drain . . .

(Continued from page 51)

terials entering the cooling system, DuPont points out that exhaust gas contains nitrogen oxides, sulphur oxides, formaldehyde and organic acids. These compounds dissolve in the anti-freeze and form salts which are corrosive, particularly on the acid side. Addition of alkaline inhibitors will reduce but not prevent their metal corroding action. It is for this reason that DuPont states that any cooling solution containing them should be removed from the system. DuPont claims that extensive tests have shown that ordinarily Telar need not be drained in the spring unless under the circumstances described above. In a road test begun in October 1955 and augmented by more than 200 cars in 1957, with additional cars in October 1958, only one case of chemical breakdown in the solution of Telar was discovered. In this case there was a mechanical failure of the engine cooling system in the form of a leaking gasket.

Chevrolet recommends: "Drain and flush the cooling system every spring and fall. . . . If filled with GM (or equivalent) glycol permanent type anti-freeze, it will not be necessary to replace solution more often than once a year. . . . When refilling with water, add a good corrosion inhibitor such as GM Anti-Rust and Water Pump Lubricant."

With this defect the solution did become acid and the color of the solution changed from red to yellow.

One of the tests conducted by DuPont to determine the cooling qualities of glycol base coolant was to note if there was any change in the fuel octane number requirement during warm weather. It was found that no increase in octane requirement was noted with 40 per cent Telar and 60 per cent water mixture as compared with all water. This solution is equivalent to approximately a mixture which would protect to minus 10°F.

ZERONE AND ZEREX CONTINUED

As is the case with other anti-freeze manufacturers who have added the "permanent" type to their line of products, DuPont continues its Zerone and Zerex anti-freezes in which draining is recommended at the end of each anti-freeze season. That is, with these, we go back to the original two flush and drain operations a year; one just before summer and the other just before winter. In the case of Zerex, when used by fleet owners, there is a Zerex analyzer available for testing the anti-freeze solution. This will indicate whether it is qualified for another season's use. The analyzer is used almost exclusively by fleet owners since use by the individual owners would be impractical.

DuPont points out the fact that modern cooling systems are under greater load than ever before because of the sharp increase in engine horsepower in recent years. In an engineering paper, DuPont states that in 1950 the average brake horsepower was 113 and cooling system capacity was 16.5 quarts. In 1960 the average brake horsepower was about 245 and the cooling system capacity was **still** 16.5 quarts. This represents an increase of 8 horsepower per quart of coolant in the last ten years.

DuPont further states that about 700,000 automobile radiators have to be replaced each year and many more require expensive repairs. Many of these radiator failures are due to rust and corrosion, caused by worn out anti-freeze. DuPont states, "Automotive authorities agree that anti-freezes, including most of the so-called 'permanent' types, should be drained at winter's end because rust inhibitors usually wear out and become acid after a season's use."

NOT "PUSHING THE PERMANENT"

Union Carbide Consumer Products Company, which is a division of the Union Carbide Corporation, markets one of the pioneer non-evaporating anti-freeze products well known as Prestone. This organization naturally joined the parade with its own "permanent" anti-freeze designed to eliminate spring draining and flushing. Like all of the so-called permanent products, it costs more than the standard-type of anti-freeze. But to say that this company is not pushing its "permanent" product is an under-statement. This company, along with practically every car manufacturer, recommends a spring draining and flushing plus fresh water and a good summer inhibitor.

According to A. M. Fischer, manager of technical services, Anti-Freeze Department of Union Carbide Consumer Products Company, this organization has been careful to follow the draining recommendations of the car factories. These recommendations indicate that they are in general agreement as to a spring and fall drain and the use of water with a rust inhibitor for hot-weather operation.

Fischer points out that water is the best heat transfer agent, and in some engines that are sensitive to octane requirement, at high ambient temperatures under heavy load conditions, the use of glycol solutions in the summertime is undesirable. Many passenger cars reject heat from the automatic transmission fluid into the engine coolant via a heat exchanger in the bottom tank of the radiator. Elevated temperatures of the coolant under severe driving conditions can cause undesirable high-operating temperatures of the transmission fluid.

Believing that "fresh anti-freeze solutions with full strength inhibition against corrosion are to be preferred for winter driving to used solutions whose protection against corrosion is questionable," are the

(Continued on page 76)

BRUSHING UP ON THOSE

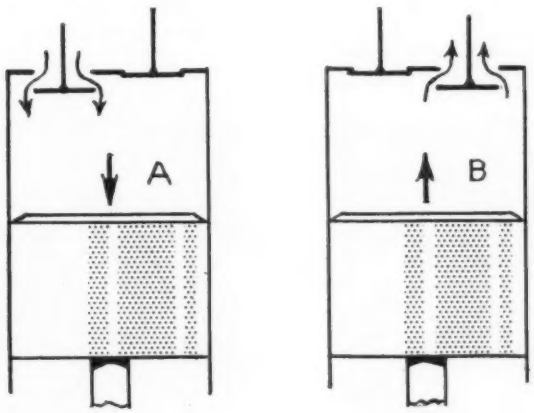
EASY-TO-FORGET THINGS

Refresher course

✔ *Volumetric efficiency . . . what it means!*

• AN ENGINE CYLINDER in normal operation never draws in as much air per cycle as is indicated by the piston displacement volume at atmospheric pressure and temperature. The latter would be a complete charge.

Volumetric efficiency is the ratio of the amount of air actually taken in per cycle to complete a charge. It is an engine's ability to breathe.



As piston moves down on intake stroke A, partial vacuum exists in cylinder, causing air flow. Air is displaced on exhaust stroke, B.

Theoretically, the engine should take in and discharge an amount of air equal to its cubic inch piston displacement during two revolutions of the crankshaft.

But, the ratio of the amount of air actually taken in decreases as the engine speed increases, increases and decreases with the relative size of the intake-valve-opening area. It varies, too, with the valve timing and relative amount of heat imparted to the entering charge in the carburetor, inlet manifold and the cylinder itself during the intake stroke period.

At higher engine speed, the valves are open for a shorter period, there is more restriction to air flow caused by the air passing through the carburetor, valves and manifold which, with the inertia of the air partially chokes off the amount of air coming into the engine.

●

Tool Tips *for the Mechanic*

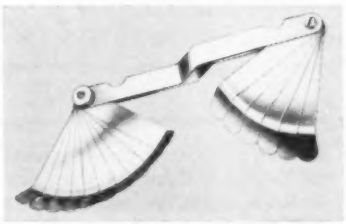
Pulling Tight Valve Seats

Here's the quick way—use a SNAP-ON® CJ-66-15 puller head, 66-1 screw shaft, 66-2 hammer, and the 66-15-3 plug. Use it on Chrysler V-8; Buick and Cadillac engines; International and MM tractor engines; Continental, many GMC and other industrial engines. Page 108, Catalog X.

Brake Adjustments on Fords

The SNAP-ON S-9465-A Chrysler Fluid Drive coupling wrench is a dandy tool for adjusting Ford brakes. Mechanics will like it because it easily clears the radius rod and transverse spring. Page 80, Catalog X.

NEW TOOL



Snap-on GA-117

Feeler Gauge

SNAP-ON dealers have received many requests from mechanics for bent feeler blades for overhead valve adjustment work. So—here it is—the new GA-117 feeler gauge. It contains 16 blades bent at a 45-degree angle, ¾ in. from the end with 16 sizes from .009 to .027. You can check overhead valves with this feeler without getting any burned or skinned knuckles. Give your hands a break; get a set of these feelers from your SNAP-ON man the next time he stops.

Removing Chevy Heater & Radiator Hoses

You can remove new-style hose clamps in a breeze with the SNAP-ON HCP-48BP hose clamp plier. Page 68, Catalog X.

Torquing Pitman Arms

GM insists that Pitman arm nuts on Buicks, Oldsmobiles and Pontiacs be torqued to 150 ft-lb before leaving the assembly line at Wilmington, Delaware. If you want to keep your work up to factory standards, get a SNAP-ON TQ-250 TORQOMETER® to do this job. Page 45, Catalog X.

SNAP-ON TOOLS CORPORATION

8035-C 28th Avenue • Kenosha, Wisconsin

(Circle No. 135 on Reader Service Card)

To Drain or Not to Drain . . . CONTINUED

major reasons given why Union Carbide prefers to go along with the car factories. Thus for summer operation this company, although it has a "permanent-type" anti-freeze for those who demand it, recommends a soluble oil-type of inhibitor which contains an anti-rust and water pump lubricant. This type of summer corrosion inhibitor is also recommended by most of the car factories.

The inhibitors in Prestone brand anti-freeze consist of a boronglycol complex containing special ions of the alkaline earth series with both organic and inorganic compounds specifically designed to inhibit foaming and protect all cooling system metals, including wrought and cast aluminum.

SO WHAT DOES ALL THIS MEAN?

With all of these varying views, as well as a great deal of other material before us, it is probable that the recommendations of the various car manufacturers, which as stated, are practically unanimous, will generally be followed, at least for the present. These are practically unanimous in favor of the spring and fall drain. Both Chevrolet and American Motors have a clause in their recommendations stating that, "if an all-year type of anti-freeze is used, and if the cooling system is in good condition, one draining a year is sufficient."

Corvette Owners Guide recommends: "Use only inhibiting anti-freeze solutions. . . . When plain water is used, the addition of a soluble oil is recommended. . . . The radiator and block should be drained and flushed twice a year if no anti-freeze is used. If permanent anti-freeze is used, cooling system may be drained and flushed once yearly. . . ."

Looking at it another way, many claim that the cost of the permanent anti-freeze is enough higher than the standard type that the motorist is not actually saving himself any money by using them and there are some instances (such as a gasket leak) where costly repairs might become necessary.

WHAT ABOUT ALUMINUM?

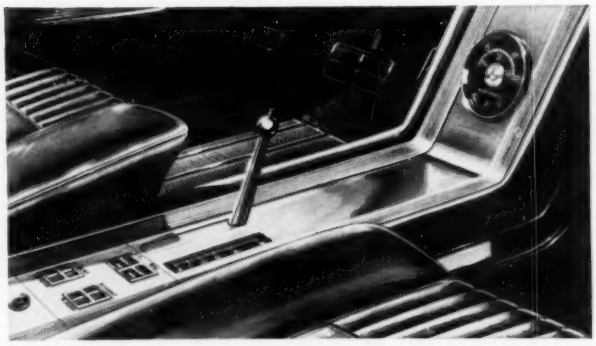
The other factor which is now very important is the effect of anti-freeze solutions on aluminum. This question came strongly to the front with the introduction last year of aluminum cylinder blocks. It was found that certain inhibitors could cause damage but quick action by all of the chemical companies concerned soon cured the situation so that today there is hardly any problem.

The inhibitor situation involves some ticklish chemical questions. It is just as harmful to have too much of certain ingredients as it is too little. In other words, an inhibitor must be balanced in order to give results. The basic anti-freeze inhibitor is borax (sodium metaborate). Authorities point out that borax concentrations below the level of 2 per cent will provide satisfactory inhibitor qualities for one season without excessive aluminum damage. Concentrations beyond the 2 per cent will result in significant aluminum corrosion.

The current inhibitors have the proper concentrations in the proper quantities to protect the entire system, including aluminum, for one season. However, it is pointed out that when these concentrations are increased to give "long life," they do have a detrimental effect on aluminum components. There are also other elements present in a well-formulated anti-freeze. There are anti-foaming agents and other protective devices which are mainly concerned with the proper alkaline balance and so primary interest in cast iron engines is on the positive side, with aluminum engines on the negative side.

While all of this may seem complicated, it comes back to one solid fact which is certainly re-assuring in that all responsible companies, without exception, are using inhibitors today which will not harm any aluminum engines or aluminum engine parts. As an engineer in one of the larger aluminum companies told us recently, "The problems of preventing corrosion in aluminum are nowhere near as tough as the problems that we overcame years ago with cast iron."

Oldsmobile's Starfire Has Sports Car Motif



• SPORTS CAR MOTIF of Oldsmobile's new Starfire convertible is further accented by the handy control console located between the front bucket seats. Easily accessible on the console are the power controls for the electrically-driven windows and the shift lever for the Hydra-Matic transmission. In addition, an engine tachometer on the forward inclined edge of the console gives a quick index of performance and a chrome-covered compartment at the rear of the console provides extra storage space and can be locked.

The car, now in limited production at Lansing, Mich., and South Gate, Calif., combines several highlights of the 1961 Oldsmobile line, but has its own styling features. It's equipped with a high compression engine coupled with a coordinated power train for excellent highway performance.

Have you Used Equipment for Sale?
Use our Classified Columns—Page 80

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FIRM NAME_____

STREET ADDRESS_____

CITY, ZONE & STATE_____

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Advertisers using an abbreviated firm name or post office box address, must furnish a *complete* firm name street address and the name of owner, president or general manager, for our office records.

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Automotive Publisher seeks aggressive Agents who now call on Automotive Jobbers.
Easy way to earn extra money.
No subscription selling required.
For further information contact

Automotive Service Digest
Dept. CWT
900 So. Wabash Ave., Chicago 5, Illinois

AUTOMOTIVE BODY TOOLS

NEW AND RESHARPENED Auto Body Files. File resharpening, quick service, quality workmanship, competitive prices. A. O. Barnes Company, Anderson, Indiana.

DEALER SERVICE

AUTO GLASS replacement techniques. Professional installations explained. Monthly features save time and money. Auto Glass Journal, 50 Marlboro, Wood-Ridge, New Jersey.

EDUCATION AND INSTRUCTION

STORAGE BATTERIES—New 120 Page Manual gives full instructions. New and Rebuilt. Free Details. P.O. Box 341, New Castle, Pa.

EQUIPMENT

VAN NORMAN Crankshaft Grinder Model H for large shafts. Also Landis Crankshaft Grinder 18 inches by 64 inches between centers, both in excellent condition, bargain. Adams, 1128 Iris Street, San Luis Obispo, Calif.

LEMPCO 545 Automatic Head Surfacer, also VAN NORMAN 562, both excellent. TOBIN ARP Bearing Resizer, VAN NORMAN Piston Grinder, Metco Metal Spray Gun complete. Adams, 1128 Iris Street, San Luis Obispo, Calif.

NEW PRESSURE WASHERS for sale. Manufacturer's List $495.00. Save $100.00. $395.00. For demonstration with no obligation, Phone HO 9-5840 or Post Card to R. A. Nott, 18-70 Ott Ave., Glen Ellyn, Ill.

GOVERNMENT SURPLUS

GOVERNMENT SURPLUS—How and where to buy in your area. Send $1.00, Surplus Information, Department AS, Headquarters Building, Washington 6, D.C.

INVENTIONS WANTED

INVENTIONS Wanted for immediate promotion! Patented; unpatented. Outright Cash or Royalties. Free Protection Form; write Casco Mills Building, Washington 6, D.C.

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AD BOOK MATCHES
Sell Full or Part Time.

Cash daily commissions bring you tops in steady earnings: Premium Plan for you, customers, lands big orders. Show Glamour Girls, Sensational Tenorama, Hillbillies, Big Holiday Line now ready. All wanted sizes. FREE Master Outfit tells you where to go, who to see, what to say, for quick sales. Fast Action if you give age, experience.

SUPERIOR MATCH
Dept. BA 1260, 7530 S. Greenwood, Chicago 19

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Calendar of Automotive Events

1961

May 14-17—Automotive Engine Rebuilders Assn., 39th Annual Convention, Hotel Fontainebleau, Miami Beach, Fla.

June 28-July 1—IGO National Convention, Lowry Hotel, St. Paul, Minn.

July 31-Aug. 2—National Auto Accessories & Parts Exhibit, Las Vegas, Nev.

Oct. 29-Nov. 1—National Lubricating Grease Institute, 29th Annual Meeting, Rice Hotel, Houston, Texas.

1962

Feb. 28-March 3—International Automotive Service Industries Show, Navy Pier, Chicago, Ill.

E-6

FLEET Hydraulic HAND JACKS

Fully guaranteed—tested at 1½ times rated capacity.

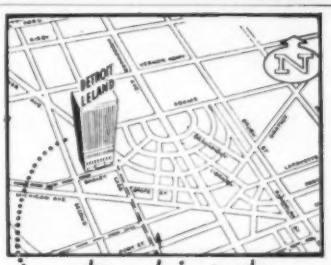
1½, 3, 5, 8, 12, 20, 30, 50, 100 TONS Regular and Tall models.

Operate in horizontal or vertical position. For car, truck and heavy equipment service, industrial and construction uses.

- Straight line oil flow thru valves
- Safety oil vent
- Gravity seating valve—no springs
- Large diameter extension screws

See them at your NAPA Jobber

EDGEWATER AUTOMOTIVE DIV.
St. Joseph, Michigan



...center of importance in DETROIT

- 800 fine rooms with bath, radio, TV
- Grenadier Dining Room and Lounge
- Coffee Shop
- Convention Facilities
- Ample Parking

Lanson M. Boyer, Gen. Mgr.

DETROIT LELAND HOTEL AAA
CASS AVE. AT BAGLEY
DOWNTOWN DETROIT 26, MICHIGAN

HE WHO LAUGHS, COME WHAT MAY,

WILL LIVE TO LAUGH ANOTHER DAY

Short circuit smiles

This is one census story we have to pass on. An El Paso woman knocked at a two-story frame house and got no reply. She was about to leave when a man appeared hurriedly and asked:

"Can I help you?"

"I was just going to ask how many rooms you have," she told him.

"Oh, we have plenty," he assured her, putting a fatherly arm around her shoulder. "You come right in and don't worry about a thing."

Somewhat non-plussed, she followed him inside and was introduced to another woman.

"Hello," said the woman pleasantly. "What can we do for you?"

"I'm with the Census Bureau," explained the caller.

The woman looked startled, not to say shocked. Then she burst out laughing.

"Oh, we misunderstood," she said. "This is the Salvation Army home for unwed mothers."

★ ★ ★

A tourist in New York City asked a beatnik: "How can I get to Carnegie Hall?"

"Practice, man, practice," he answered.

★ ★ ★

Manager: "Why aren't you busy? Can't you find something to do?"

Employe: "You mean I have to find it too?"

★ ★ ★

The purchasing agent's wife had insisted on taking along about every garment she owned and they arrived at the station loaded with luggage. "I wish," commented her husband, "that we had brought your piano."

"Oh, quit trying to be funny," she said frigidly.

"I'm not trying to be funny," answered the PA wistfully. "I left the tickets on it."

At a 25th wedding anniversary party the husband seemed very morose, so a friend tried to console him. The husband explained, "On our fifth anniversary I wanted to kill my wife but my lawyer told me I'd get 20 years. Just think! Today I could be a free man!"

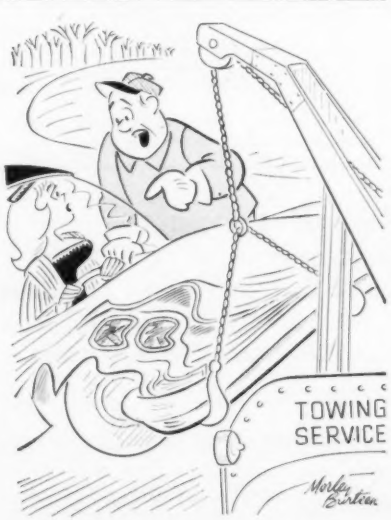
★ ★ ★

An Eastern guest at a dude ranch was fascinated in watching a cowboy prepare himself a smoke. "It's wonderful," he finally remarked "the way you can roll a cigarette with one hand."

"Taint nothin'," the cowboy responded. "Gettin' the filter in is the hard part."

★ ★ ★

The difference between a pretty girl and an old maid is that a pretty girl has a lot of men in her wake, while an old maid has them only in her sleep.



"You can bang on that horn all you want, but you still can't pass me!"

During a recent convention in Los Angeles, a man walked into a women's dress shop and silently handed a saleslady a slip of paper which read:

"To whom it may concern: Since I am tired of returning black night-gowns, off-the-shoulder blouses, and similar articles after every convention, and since the bearer of this note seems to think I am exactly the size of the current sales person, here are some statistics and information: I am five-feet-three inches tall, weigh 135 pounds, wear a size 13 dress and size 10 stocking. I do not like the color green, wide stripes, polka dots, or nylons without seams. Please do not sell him the most expensive gift in the store as we have to eat next week, too. Thanking you in advance, I am, Sincerely, Wife of the Bearer."

★ ★ ★

The husband of a woman who recently learned to drive was dismayed upon returning home and seeing the car in the living room.

"How in the world did you land our car in here?"

"Nothing to it," she replied. "When I got to the kitchen I simply made a left turn."

★ ★ ★

Wouldn't it be fun if a husband could do all the things his wife suspects he does?

★ ★ ★

Greatly agitated, a woman carrying an infant dashed into a sporting goods store. The manager hurried to ascertain the cause of her distress.

"My baby swallowed a .22 calibre bullet" she cried. "What shall I do?"

"Give him the contents of a castor oil bottle," replied the manager calmly. "But be sure you don't point him at anyone."

★ ★ ★

Pat: "She's like an auto radiator."

Mike: "How's that?"

Pat: "She'll freeze up on you if you don't keep her filled with alcohol."

★ ★ ★

The old timer says: "Operating a business is like a fat woman trying to get into a girdle—you push here and push there to keep expenses down and they just pop up somewhere else!"

★ ★ ★

Little Karen was busy with her mother's knitting needles; in fact, she was so busy she didn't notice her mother come into the room.

"What are you doing, dear?" asked the mother.

"Oh," smiled the child demurely, "I'm expecting a doll for Christmas."

★ ★ ★

Two business partners were having lunch together when one of them clapped his hand to his forehead in dismay and exclaimed, "When we left the store I forgot to lock the cash box."

"Why worry about it?" his partner asked. "We're both here, aren't we?"

how RAMCO C-9 BACKBONE means less pressure, less wall drag

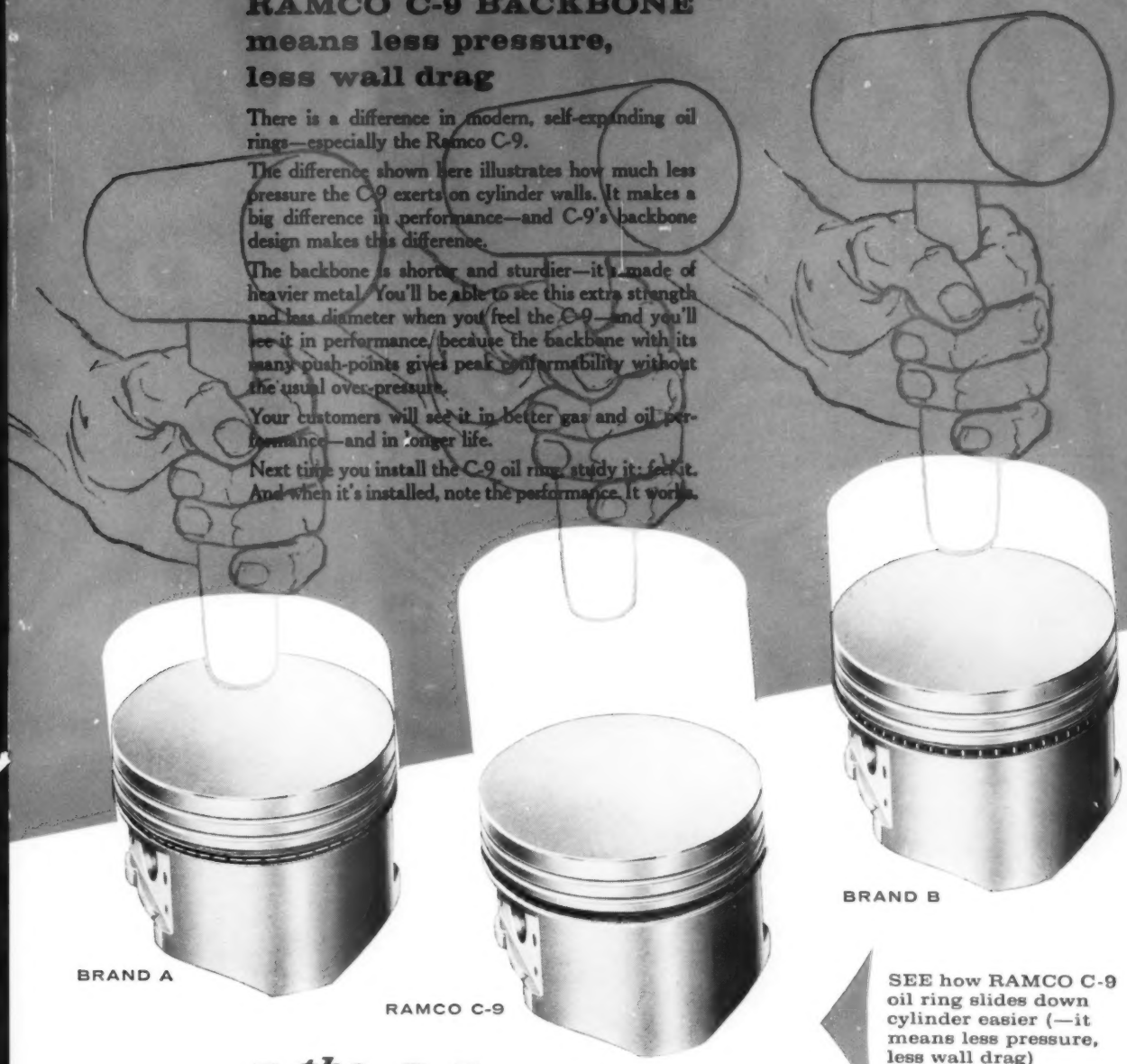
There is a difference in modern, self-expanding oil rings—especially the Ramco C-9.

The difference shown here illustrates how much less pressure the C-9 exerts on cylinder walls. It makes a big difference in performance—and C-9's backbone design makes this difference.

The backbone is shorter and sturdier—it's made of heavier metal. You'll be able to see this extra strength and less diameter when you feel the C-9—and you'll see it in performance, because the backbone with its many push-points gives peak conformability without the usual over-pressure.

Your customers will see it in better gas and oil performance—and in longer life.

Next time you install the C-9 oil ring, study it; feel it. And when it's installed, note the performance. It works.



SEE how RAMCO C-9 oil ring slides down cylinder easier (—it means less pressure, less wall drag)

the backbone makes the difference

Less wall drag is only one of many differences the Ramco backbone brings you. They're all described in our folder: "BACKBONE FACTS." See your Ramco Jobber or write for your free copy:
RAMSEY CORPORATION, ST. LOUIS 8, MISSOURI,
a subsidiary of Thompson Ramo Wooldridge Inc.

RAMCO MODERN POWER PISTON RINGS

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new

optical precision
mirror smooth

POLISHED TUNGSTEN CONTACTS

BOTH CONTACTS have EXTENDED RADII for maximum surface contact

another advance in
"the Crown Jewels of Ignition"

brings you a new,
never-before possible
freedom
from **blemishes**
pitting
misalignment

it all adds up to
. . . PROFIT for dealers
and extra value
for your customers

Filko
Crown Jewels of Ignition

F. & B. Mfg. Co.
4248 W. Chicago Ave.
Chicago 51, Illinois

GRINDING and POLISHING
for eyeglasses, microscopes and telescopes are examples of precison tolerances and perfection such as are now embodied in the new mirror smooth contacts in Filko Contact Sets for cars, trucks, tractors, marine, fractional h.p. engines.

G 116